Liebert®

POWER PROTECTION

Series 600™ UPS

Multi-Module Three Phase
338 kVA to 1000 kVA; 60 Hz

Installation Manual

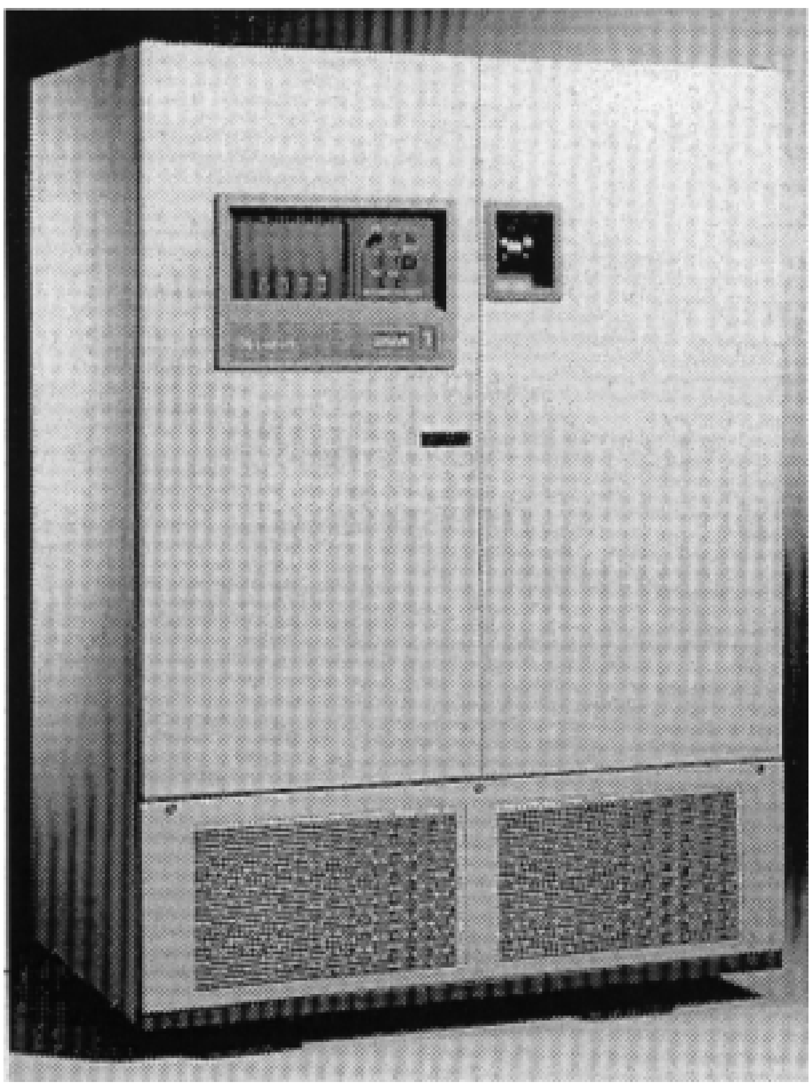


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IMPORTANT SAFETY INSTRUCTIONS

Save These Instructions.

This manual contains important instructions that should be followed during installation of your Series 600 UPS and batteries.

WARNING

EXERCISE EXTREME CARE WHEN HANDLING UPS CABINETS TO AVOID EQUIPMENT DAMAGE OR INJURY TO PERSONNEL. THE UPS MODULE WEIGHT RANGES FROM 8300 POUNDS (3765 KG) TO 17400 POUNDS (7893 KG).

LOCATE CENTER OF GRAVITY SYMBOLS BEFORE HANDLING EACH CABINET. TEST LIFT AND BALANCE THE CABINETS BEFORE TRANSPORTING. MAINTAIN MINIMUM TILT FROM VERTICAL AT ALL TIMES.

MODULES AND SYSTEM CONTROL CABINETS (SCC'S) HAVE HOLES INTENDED FOR RIGGING BARS OR CHAINS. PREVENT CHAINS OR CABLES FROM CONTACTING CABINET BY USING SPREADER BAR AND ADEQUATE PADDING.

MODULES ARE SUPPLIED WITH BOLT-ON BRACKETS FOR USE WITH FORKLIFT. RECTANGULAR HOLES ARE PROVIDED FOR USE WITH ROL-A-LIFTS.

FOLLOW ALL BATTERY SAFETY PRECAUTIONS WHEN INSTALLING, CHARGING, OR SERVICING BATTERIES. IN ADDITION TO THE HAZARD OF ELECTRIC SHOCK, GAS PRODUCED BY BATTERIES CAN BE EXPLOSIVE AND SULFURIC ACID CAN CAUSE SEVERE BURNS.

IN CASE OF FIRE INVOLVING ELECTRICAL EQUIPMENT, ONLY CARBON DIOXIDE FIRE EXTINGUISHERS, OR THOSE APPROVED FOR USE IN ELECTRICAL FIRE FIGHTING, SHOULD BE USED.

EXTREME CAUTION IS REQUIRED WHEN PERFORMING MAINTENANCE.

BE CONSTANTLY AWARE THAT THE UPS SYSTEM CONTAINS HIGH DC AS WELL AS AC VOLTAGES.

CHECK FOR VOLTAGE WITH BOTH AC AND DC VOLTMETERS PRIOR TO MAKING CONTACT.

WARNING
LOCATE CENTER OF GRAVITY SYMBOLS ◐
AND DETERMINE UNIT WEIGHT
BEFORE HANDLING CABINET.

If you require assistance for any reason, call the toll-free Liebert Customer Service & Support number; 1-800-543-2378. For CS&S to assist you expediently, please have the following information available:

Part Numbers: ______________________________

Serial Numbers: ______________________________

kVA Rating: ______________________________

Date Purchased: ______________________________

Date Installed: ______________________________

Location: ______________________________

Input Voltage: ______________________________

Output Voltage: ______________________________

Battery Reserve Time: ______________________________

1.0 SAFETY PRECAUTIONS

Read this manual thoroughly, paying special attention to the sections that apply to you, before working with the UPS. Retain this section for use by installing personnel.

Under typical operation and with all UPS doors closed, only normal safety precautions are necessary. The area around the UPS system should be kept free from puddles of water, excess moisture, or debris.

Special safety precautions are required for procedures involving handling, installation, and maintenance of the UPS system or the battery. Observe all safety precautions in this manual before handling or installing the UPS system. Observe all safety precautions in the **Operation and Maintenance Manual,** before as well as during performance of all maintenance procedures. Observe all battery safety precautions before working on or near the battery.

This equipment contains several circuits that are energized with high voltage. Only test equipment designated for troubleshooting should be used. This is particularly true for oscilloscopes. Always check with an AC and DC voltmeter to ensure safety before making contact or using tools. Even when the power is turned Off, dangerously high potentials may exist at the capacitor banks and at the batteries.

ONLY qualified service personnel should perform maintenance on the UPS system. When performing maintenance with any part of the equipment under power, service personnel and test equipment should be standing on rubber mats. The service personnel should wear insulating shoes for isolation from direct contact with the floor (earth ground).

Unless all power is removed from the equipment, one person should never work alone. A second person should be standing by to assist and summon help in case an accident should occur.

Three types of messages are used throughout the manual to stress important text. Carefully read the text below each Warning, Caution, and Note and use professional skills and prudent care when performing the actions described by that text.

A **Warning** signals the presence of a possible serious, life-threatening condition. For example:

WARNING
LETHAL VOLTAGES MAY BE PRESENT WITHIN THIS UNIT EVEN WHEN IT IS APPARENTLY NOT OPERATING. OBSERVE ALL CAUTIONS AND WARNINGS IN THIS MANUAL. FAILURE TO DO SO COULD RESULT IN SERIOUS INJURY OR DEATH. DO NOT WORK ON OR OPERATE THIS EQUIPMENT UNLESS YOU ARE FULLY QUALIFIED TO DO SO!! NEVER WORK ALONE.

A **Caution** indicates a condition that could seriously damage equipment and possibly injure personnel. For example:

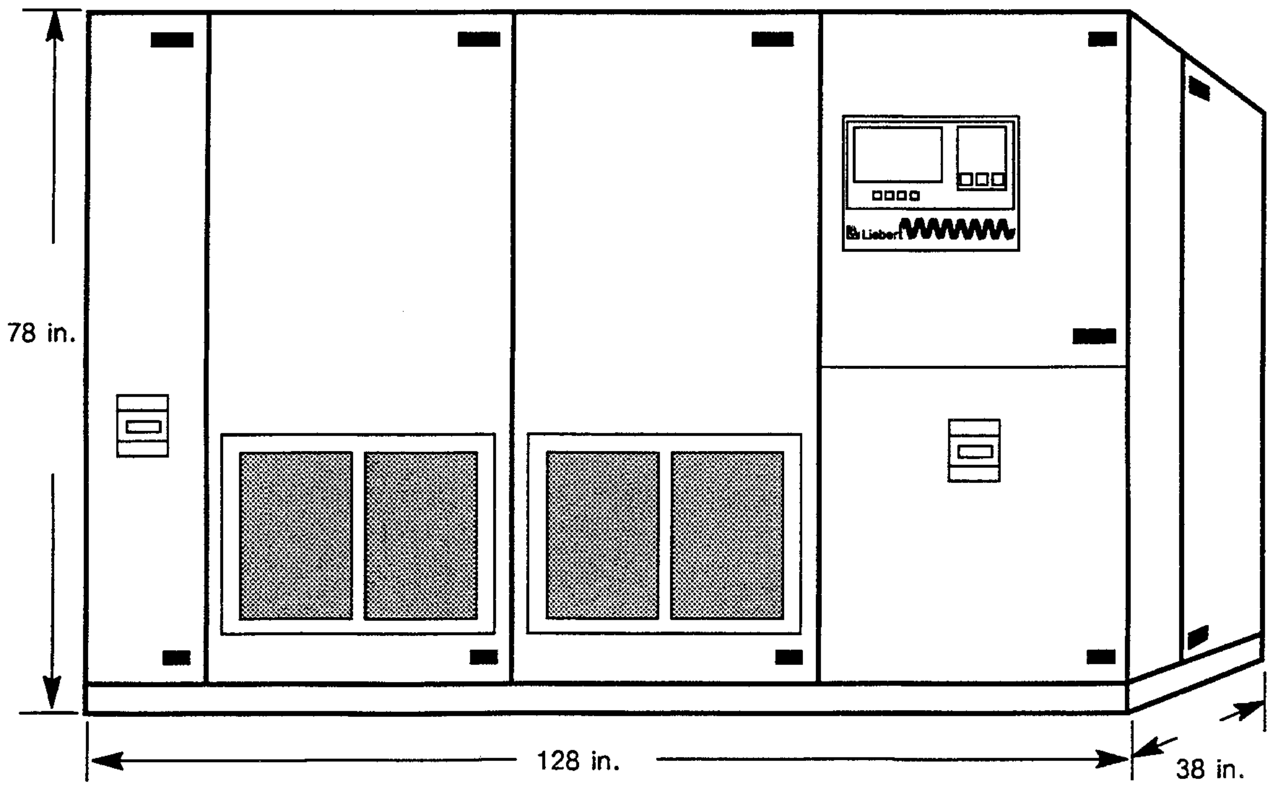
CAUTION
Extreme care is necessary when removing shoring braces. Do not strike the cabinet with hammers or other tools.

A **Note** emphasizes important text. If the note is not followed, equipment could be damaged or may not operate properly. For example:

NOTE
If the UPS system has a blown fuse, the cause should be determined before you replace the fuse. Contact Liebert Customer Service and Support.

WARNING
LOCATE CENTER OF GRAVITY SYMBOLS AND DETERMINE UNIT WEIGHT BEFORE HANDLING CABINET.

Figure 1 Multi-Module 338 kVA UPS



Each UPS module is shipped as two or three separate cabinets for easier handling. Refer to the Shipping Split Detail drawing for dimensions and weights of your units.

2.0 INSTALLATION CONSIDERATIONS

Install your Series 600 UPS in accordance with the submittal drawing package and the following procedures.

A Liebert authorized representative must perform the initial system check-out and start-up to ensure proper system operation. Equipment warranties will be voided unless system start-up is performed by a Liebert authorized representative. Contact your local Liebert sales representative or Liebert Customer Service and Support at **1-800-543-2378** to arrange for system start-up.

CAUTION

Read this manual thoroughly before attempting to wire or operate the unit. Improper installation is the most significant cause of UPS start-up problems.

Do not install this equipment near gas or electric heaters. It is preferable to install the UPS in a restricted location to prevent access by unauthorized personnel.

Proper planning will speed unloading, location, and connection of the UPS. **Refer to Figure 4 through Figure 68 and Appendix A - Series 600 UPS Site Planning Data.**

Use the shortest output distribution cable runs possible, consistent with logical equipment arrangements and with allowances for future additions if planned.

Recommended ambient operating temperature is 25°C (77°F). Relative humidity must be less than 95%, non-condensing. Note that room ventilation is necessary, but air conditioning may not be required. Maximum ambient operating temperature is 40°C (104°F). The batteries should not exceed 25°C (77°F). At elevations above 4,000 feet (1219 meters) derating may be required (consult your Liebert sales representative).

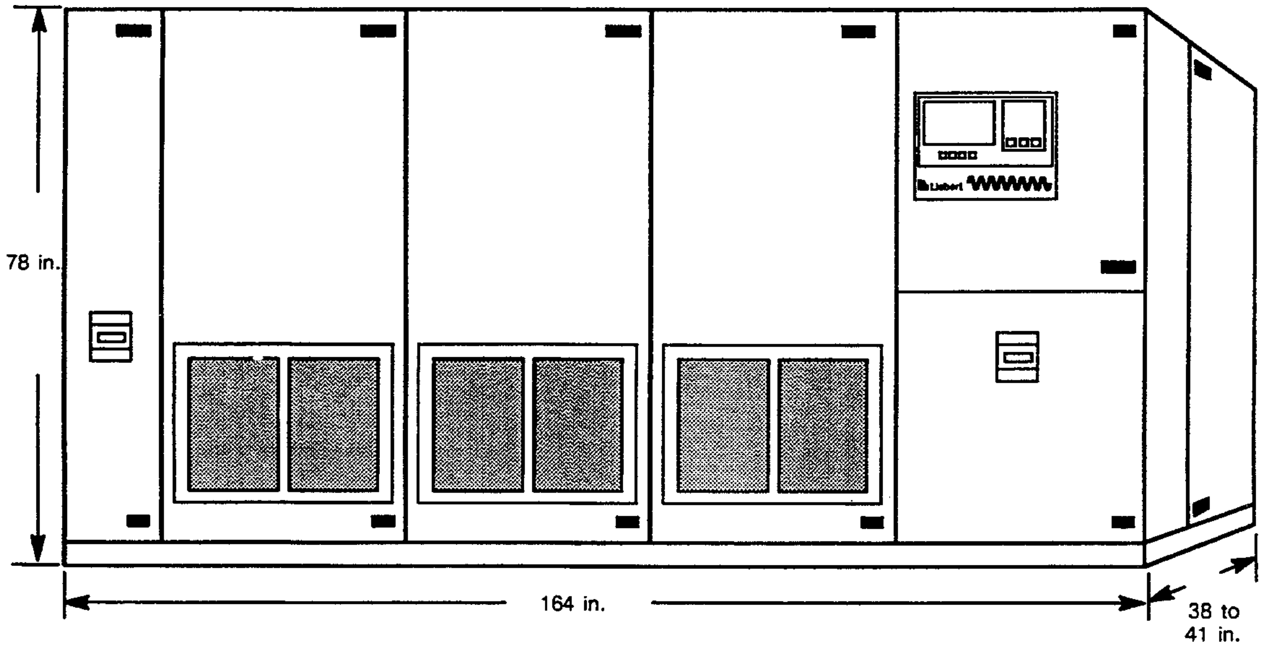
1. Even though your Liebert UPS unit is at least 91% efficient, the heat output is substantial. For more specific information, see **Appendix A - Series 600 UPS Site Planning Data.** Be sure environmental conditioning systems can accommodate this BTU load, even during utility outages.
2. The routing (inside the facility) to the installation site, as well as the floor at the final equipment location, must be capable of supporting the cabinet weight and the weight of any moving equipment. The modules weigh between 8300 and 17400 pounds. Refer to **Appendix A - Series 600 UPS Site Planning Data.**
3. Plan the routing to ensure that the unit can move through all aisleways, doorways, and around corners without risking damage.

CAUTION

Observe all battery safety precautions when working on or near the battery.

WARNING
LOCATE CENTER OF GRAVITY SYMBOLS
AND DETERMINE UNIT WEIGHT
BEFORE HANDLING CABINET.

Figure 2 Multi-Module 400 to 1000 kVA UPS



Cabinet depth of 400 and 500 kVA modules is 38 inches.
Cabinet depth of 625 and 750 (HL) kVA modules is 41 inches.

Refer to drawings for 208 VAC dimensions (338 to 500 kVA)
and for 750 (LL) and 1000 kVA modules (not shown).

Each UPS module is shipped as two or three separate cabinets for easier handling.
Refer to the Shipping Split Detail drawing for dimensions and weights of your units.

3.0 UNLOADING AND HANDLING

The UPS module is shipped as separate cabinets to allow easy handling at the site. Because the weight distribution in the cabinets is uneven, use extreme care during handling and transport.

WARNING

ONLY QUALIFIED PERSONNEL SHOULD HANDLE THIS EQUIPMENT. EXERCISE EXTREME CARE WHEN HANDLING UPS CABINETS TO AVOID EQUIPMENT DAMAGE OR INJURY TO PERSONNEL. THE UPS MODULE WEIGHT RANGES FROM 8300 POUNDS TO 17400 POUNDS.

LOCATE CENTER OF GRAVITY SYMBOLS BEFORE HANDLING EACH CABINET. TEST LIFT AND BALANCE THE CABINET BEFORE TRANSPORTING. MAINTAIN MINIMUM TILT FROM VERTICAL AT ALL TIMES.

MODULES AND SYSTEM CONTROL CABINETS (SCC'S) HAVE HOLES INTENDED FOR RIGGING BARS OR CHAINS. PREVENT CHAINS OR CABLES FROM CONTACTING CABINET BY USING SPREADER BAR AND ADEQUATE PADDING.

MODULES ARE SUPPLIED WITH BOLT-ON BRACKETS FOR USE WITH FORKLIFT. RECTANGULAR HOLES ARE PROVIDED FOR USE WITH ROL-A-LIFTS.

To reduce the possibility of shipping damage, cabinets are shored with 2x4 bracing, secured with screw-type nails. This shoring must be carefully removed prior to unloading.

CAUTION

Extreme care is necessary when removing shoring braces. Do not strike cabinet with hammers or other tools.

4.0 Inspections

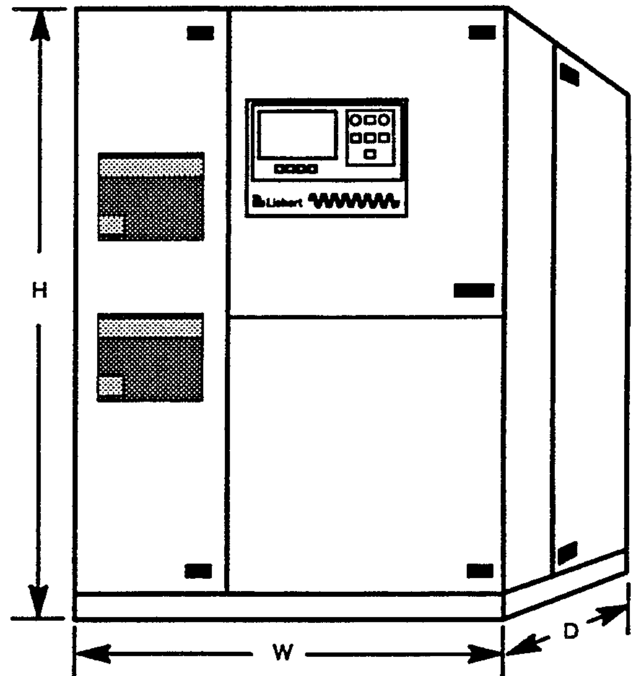
4.1 External Inspections

1. While the UPS system is still on the truck, inspect the equipment and shipping container(s) for any signs of damage or mishandling. Do not attempt to install the system if damage is apparent. If any damage is noted, file a damage claim with the shipping agency within 24 hours and contact Liebert Customer Service and Support at 1-800-543-2378 to inform them of the damage claim and the condition of the equipment.
2. Locate the bag containing the keys for the front access door. The bag is attached to the cabinet.
3. Compare the contents of the shipment with the bill of lading. Report any missing items to the carrier and to Liebert Customer Service and Support immediately.
4. Check the nameplate on the cabinets to verify that the model numbers correspond with the one specified. Record the model numbers and serial numbers in the front of this installation manual. A record of this information is necessary should servicing become required.

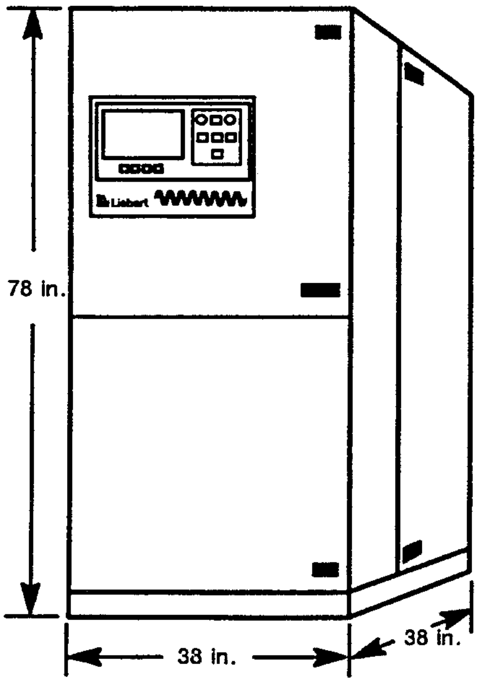
4.2 Internal Inspections

1. Verify that all items have been received.
2. If spare parts were ordered, verify arrival.
3. Open doors and remove cabinet panels to check for shipping damage to internal components.
4. Check for loose connections or unsecured components in the cabinet(s).
5. Check for installation of circuit breaker line safety shields. There should be no exposed circuit breaker terminals when the cabinet doors are opened.
6. Check for any unsafe condition that may be a potential safety hazard.
7. UPS modules are shipped with internally mounted shipping brackets. The shipping brackets (painted orange) must be removed from the rear (remove rear panels).

Figure 3 System Control Cabinets



SCCB



SCCA

800 to 900 lbs.
800 to 4000 amperes

SCCB DIMENSIONS

AMPS	W x D x H (Inches)	WEIGHT Lbs.
4000	134 x 62 x 78	4900
3000	61 x 50 x 78	2400
2500	61 x 50 x 78	2400
2000	61 x 50 x 78	2400
1600	61 x 50 x 78	2000
1280	61 x 50 x 78	2000
800	38 x 38 x 78	1100

TYPES OF SYSTEM CONTROL CABINETS (SCC)

SCCA A stand **alone** cabinet containing system control logic for up to six UPS modules, static bypass switch, manually operated disconnects for static bypass switch, but no motor operated system circuit breakers.

SCCB A stand alone cabinet containing all of the above plus 2 motor operated system circuit **breakers**.

SCCC An integrated configuration (like SCCI) with the static bypass switch rated for **continuous** duty.

SCCI System control logic and static bypass switch are **integrated** into a switchboard cabinet manufactured by others, which also includes the system circuit breakers.

SCCP A stand alone cabinet similar to SCCB except smaller in width (38 in.) and designed for two UPS modules (a **pair**). Current range is 240 to 2000 amperes. Weight ranges from 1000 to 1400 pounds.

5.0 Equipment Location

1. Handle cabinets in accordance with **WARNINGS** in **3.0 - Unloading and Handling.** Use a suitable material handling device to move each cabinet to its final location. **Exercise extreme care because of the uneven weight distribution.**
2. Carefully lower the cabinets to the floor and position them for cabinet interconnection.
3. Verify that the UPS system is installed in a clean, cool and dry location.
4. Installation and serviceability will be easier if adequate access is provided on all sides of the equipment, but only access to the front and right side is required.
    a. Verify that there is adequate clearance to open cabinet doors. See drawings and local codes (4 feet is recommended).
    b. Verify that there is adequate area in front of circuit breakers to perform maintenance. Check installation drawings for location of breakers. Check with local codes.
    c. Verify that there is adequate clearance above all cabinets to allow exhaust air to flow without restriction (2 feet minimum, unobstructed).
5. Connect the cabinets, internal cables, and bus bars. Refer to Shipping Split Details **(Figure 33** to **Figure 41)** and other drawings.

6.0 BATTERIES

6.1 Battery Safety Precautions

Installation and servicing of batteries should be performed or supervised by personnel knowledgeable of batteries and the required precautions. Keep unauthorized personnel away from batteries.

When replacing batteries, use the same number and type of batteries.

CAUTION

Lead-acid batteries contain hazardous materials. Batteries must be handled, transported, and recycled or discarded in accordance with federal, state, and local regulations. Because lead is a toxic substance, lead-acid batteries should be recycled rather than discarded.

Do not open or mutilate the battery or batteries. Released electrolyte is harmful to the skin and eyes. It may be toxic. Do not dispose of battery or batteries in a fire. The battery may explode.

A battery can present a risk of electrical shock and high short circuit current. The following precautions should be observed when working on batteries:

1. **Remove watches, rings, or other metal objects.**
2. **Use tools with insulated handles.**
3. **Wear rubber gloves and boots.**
4. **Do not lay tools or metal parts on top of batteries.**
5. **Disconnect charging source prior to connecting or disconnecting battery terminals.**
6. **Determine if battery is inadvertently grounded. If inadvertently grounded, remove source of ground. Contact with any part of a grounded battery can result in electrical shock. The likelihood of such shock will be reduced if such grounds are removed during installation and maintenance.**

Lead-acid batteries can present a risk of fire because they generate hydrogen gas. The following procedures should be followed:

1. **DO NOT SMOKE when near batteries.**
2. **DO NOT cause flame or spark in battery area.**
3. **Discharge static electricity from body before touching batteries by first touching a grounded metal surface.**

Battery Safety Precautions in French Per CSA Requirements

Instructions Importantes Concernant La Sécurité

Conserver Ces Instructions

ADVERTISSEMENT

DES PIECES SOUS ALIMENTATION SERONT LAISSEES SANS PROTECTION DURANT CES PROCEDURES D'ENTRETIEN. UN PERSONNEL QUALIFIE EST REQUIS POUR EFFECTUER CES TRAVAUX.

LES FUSIBLES A C.C. DE LA BATTERIE D'ACCUMULATEURS OPERENT EN TOUT TEMPS A LA TENSION NOMINALE. LA PRESENCE D'UN FUSIBLE A C.C. BRULE INDIQUE UN PROBLEME SERIEUX. LE REMPLACEMENT DE CE FUSIBLE, SANS AVOIR DETERMINE LES RAISONS DE LA DEFECTUOSITE, PEUT ENTRAINER DES BLESSURES OU DES DOMMAGES SERIEUX A L'EQUIPEMENT. POUR ASSISTANCE, APPELER LE DEPARTEMENT DE SERVICE A LA CLIENTELE DE LIEBERT.

DANGER

Les accumulateurs plomb-acide contiennent de la matière comportant un certain risque. Les accumulateurs doivent être manipulés, transportés et recyclés ou éliminés en accord avec les lois fédérales, provinciales et locales. Parce que le plomb est une substance toxique, les accumulateurs plomb-acide devraient être recyclés plutôt qu'éliminés.

Il ne faut pas brûlé le ou les accumulateurs. L'accumulateur pourrait alors explosé.

Il ne faut pas ouvrir ou endommager le ou les accumulateurs. L'électrolyte qui pourrait s'en échapper est dommageable pour la peau et les yeux.

Un accumulateur représente un risque de choc électrique et de haut courant de court-circuit. Lorsque des accumulateurs sont manipulés, les mesures préventives suivantes devraient être observées:

1. **Retirer toutes montre, bagues ou autres objets métalliques.**
2. **Utiliser des outils avec manchon isolé.**
3. **Porter des gants et des bottes de caoutchouc.**
4. **Ne pas déposer les outils ou les pièces métalliques sur le dessus des accumulateurs.**
5. **Interrompre la source de charge avant de raccorder ou de débrancher les bornes de la batterie d'accumulateurs.**
6. **Déterminer si l'accumulateur est mis à la terre par erreur. Si oui, défaire cette mise à la terre. Tout contact avec un accumulateur mis à la terre peut se traduire en un choc électrique. La possibilitié de tels chocs sera réduité si de telles mises à la terre sont débranchées pour la durée de l'installation ou de l'entretien.**

Les accumulateurs plomb-acide présentent un risque d'incendie parce qu'ils génèrent des gaz à l'hydrogène. Les procédures suivantes devront être respectées.

1. **NE PAS FUMER lorsque près des accumulateurs.**
2. **NE PAS produire de flammes ou d'étincelles près des accumulateurs.**
3. **Décharger toute électricité statique présente sur votre corps avant de toucher un accumulateur en touchant d'abord une surface métallique mise à la terre.**

DANGER
L'électrolyte est un acide sulfurique dilué qui est dangereux au contact de la peau et des yeux. Ce produit est corrosif et aussi conducteur electrique. Les procédures suivantes devront être observées:

1. **Porter toujours des vêtements protecteurs ainsi que des lunettes de protection pour les yeux.**
2. **Si l'électrolyte entre en contact avec la peau, nettoyer immédiatement en rinçant avec de l'eau.**
3. **Si l'électrolyte entre en contact avec les yeux, arroser immédiatement et généreusement avec de l'eau. Demander pour de l'aide médicale.**
4. **Lorsque l'électrolyte est renversée, la surface affectée devrait être nettoyée en utilisant un agent neutralisant adéquat. Une pratique courante est d'utiliser un mélange d'approximativement une livre (500 grammes) de bicarbonate de soude dans approximativement un gallon (4 litres) d'eau. Le mélange de bicarbonate de soude devra être ajouté jusqu'à ce qu'il n'y ait plus apparence de réaction (mousse). Le liquide résiduel devra être nettoyé à l'eau et la surface concernée devra être asséchée.**

6.2 Battery Installation

A remote battery disconnect switch with overcurrent protection is required per the National Electrical Code. A disconnecting means (per UL1778) such as a module battery disconnect or battery isolation switch should be provided for each parallel string of batteries. Refer to **Figure 66** and **Figure 67.** Contact your Liebert sales representative regarding this option.

1. Install battery racks and batteries per manufacturer's installation and maintenance instructions.
2. Verify battery area has adequate ventilation and battery operating temperature complies with manufacturer's specification.

If you have any questions concerning batteries, battery racks, or accessories, contact Liebert Customer Service and Support at **1-800-543-2378.**

7.0 Wiring Considerations

WARNING
ALL POWER CONNECTIONS MUST BE COMPLETED BY A LICENSED ELECTRICIAN THAT IS EXPERIENCED IN WIRING THIS TYPE OF EQUIPMENT. WIRING MUST BE INSTALLED IN ACCORDANCE WITH ALL APPLICABLE NATIONAL AND LOCAL ELECTRICAL CODES. IMPROPER WIRING MAY CAUSE DAMAGE TO THE EQUIPMENT OR INJURY TO PERSONNEL.

WARNING
VERIFY THAT ALL INCOMING HIGH AND LOW VOLTAGE POWER CIRCUITS ARE DE-ENERGIZED AND LOCKED OUT BEFORE INSTALLING CABLES OR MAKING ANY ELECTRICAL CONNECTIONS.

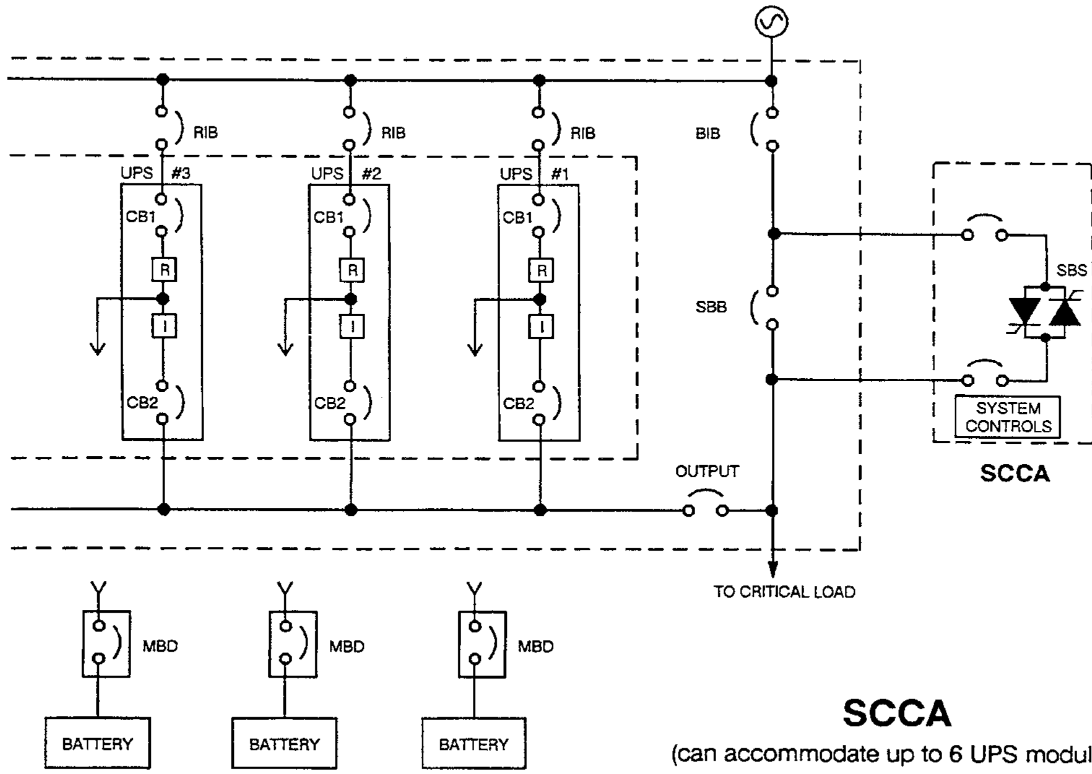
Refer to **Appendix A - Series 600 UPS Site Planning Data** and installation drawings **(Figure 4** through **Figure 68).** Determine AC currents for your system (kVA, voltage, and optional input filter). Also refer to equipment nameplate for the model number, rating, and voltage. Refer to **Table 1** and **Table 2** for wire termination data.

NOTE
Use 75°C copper wire. Select wire size based on the ampacities in ***Table 3*** *of this manual, a reprint of Table 310-16 and associated notes of the National Electrical Code (NFPA 70).*

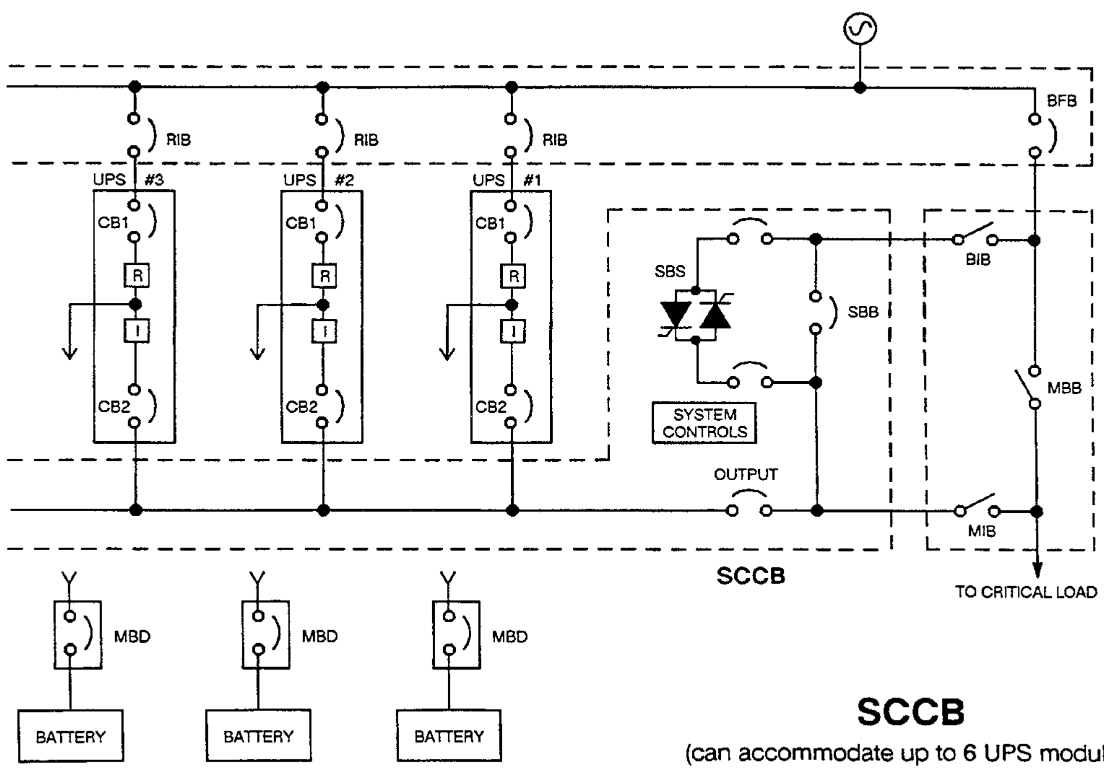
CAUTION
The weight of power cables must be adequately supported to avoid stress on bus bars and lugs. In addition to weight support, the following restraining method is recommended to control cable movement during external fault conditions: Wrap line cables together at 6 inches and 12 inches from the terminals with 5 wraps of 3/8 inch nylon rope or equivalent (tensile strength of 2000 pounds). Support remainder of cable with 5 wraps every 6 inches or 1 wrap every 1 inch.

Abbreviations for Circuit Breakers	
BFB	Bypass Feeder Breaker
BIB	Bypass Input Breaker
CB1	Module Input Breaker
CB2	Module Output Breaker
MBB	Maintenance Bypass Breaker
MBD	Module Battery Disconnect
MBFB	Maintenance Bypass Feeder Breaker
MIB	Maintenance Isolation Breaker
RIB	Rectifier Input Breaker
SBB	System Bypass Breaker
SBS	Static Bypass Switch

Figure 4   Typical Multi-Module Configurations

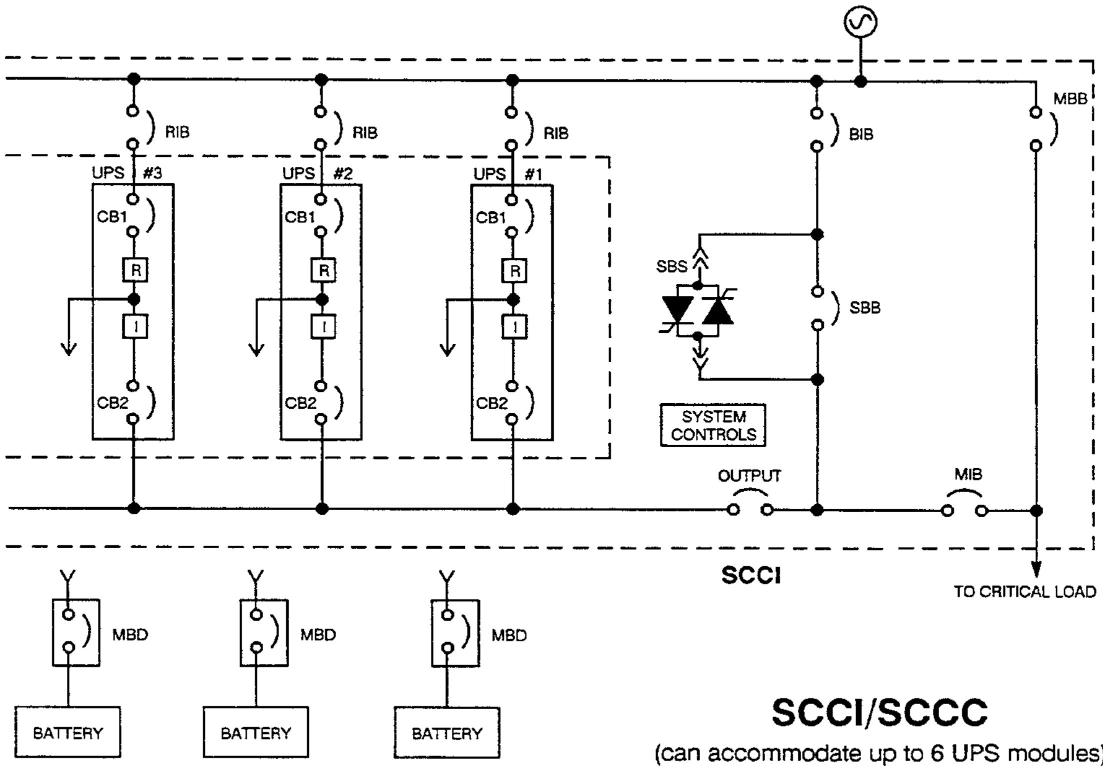


SCCA
(can accommodate up to 6 UPS modules)



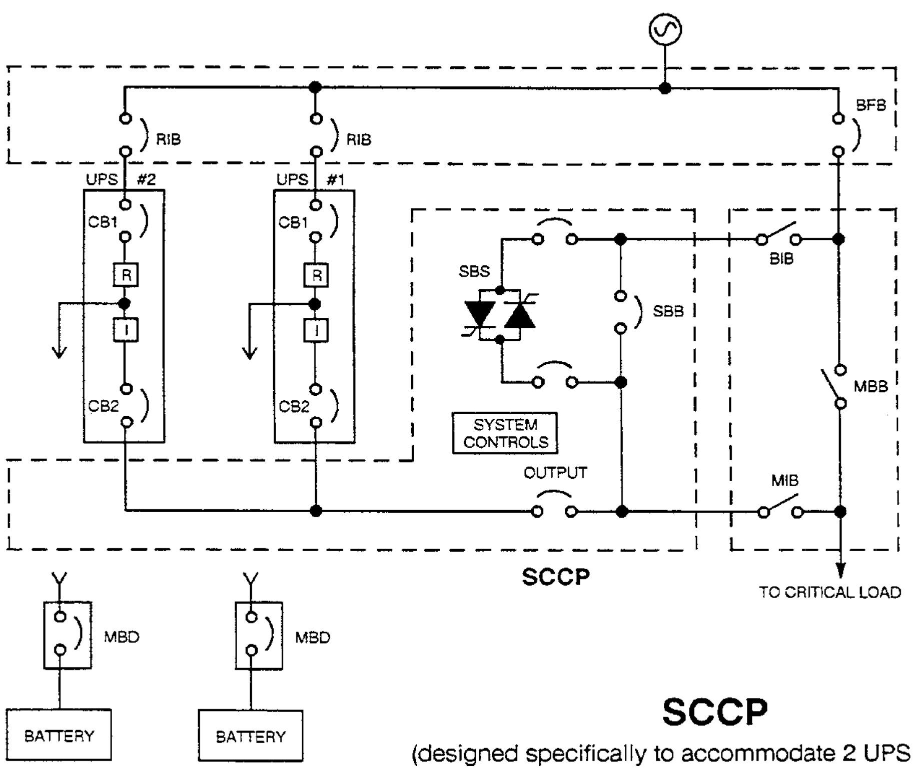
SCCB
(can accommodate up to 6 UPS modules)

Figure 4 Typical Multi-Module Configurations (continued)



SCCI/SCCC

(can accommodate up to 6 UPS modules)



SCCP

(designed specifically to accommodate 2 UPS modules)

7.1 Power and Control Wiring

1. Power wiring must be run in individual, separate conduits or cable trays. Control wiring must be stranded and run in individual separate steel conduits.

CAUTION
Power and control wiring must be separated!

2. Observe local, state and national electrical codes. Verify utility power and its overcurrent protection rating will accommodate the UPS input rating, including battery recharging.
3. A safety ground wire must be run from building ground to ground point in the UPS Module Cabinet and the SCC. The grounding conductor shall comply with the following conditions of installation:
   a. An insulated grounding conductor that is green, with or without one or more yellow stripes, is to be installed as part of the branch circuit that supplies the unit or system.
   b. The grounding conductor described above is to be grounded to earth at the service equipment or, if supplied by a separately derived system, at the supply transformer or motor-generator set.
   c. The attachment-plug receptacles in the vicinity of the unit or system are all to be of a grounding type, and the grounding conductors serving these receptacles are to be connected to earth ground at the service equipment.
4. Observe clockwise phase rotation of all power wiring. Phase A leads Phase B leads Phase C. A qualified electrician should check the phase rotation.
5. NEC Class I wiring methods are required for control and communication Class 2 circuits.

7.2 Battery Wiring

Power wiring to the batteries connects positive, negative, and ground power cables from the batteries to the associated UPS. Connection of the UPS to the batteries serves to both charge and discharge the batteries (when needed). The battery disconnect (circuit breaker) requires a control cable. Refer to **Figure 66** and **Figure 67.**

CAUTION
Be sure polarity is correct when wiring the batteries to the connected equipment (positive to positive; negative to negative). If polarity is not correct, fuse failures or equipment damage can result.

Call Liebert Customer Service and Support to schedule installation check-out and start-up.

NOTE
Inspection of the battery installation is a service that can be provided by Liebert. A Battery Specialist can perform a detailed inspection of the entire battery system to ensure it meets current IEEE standards. This inspection service is recommended because batteries are a very critical part of the UPS system.

8.0 Wiring Connections

WARNING

VERIFY THAT ALL INCOMING HIGH AND LOW VOLTAGE POWER CIRCUITS ARE DE-ENERGIZED AND LOCKED OUT BEFORE INSTALLING CABLES OR MAKING ELECTRICAL CONNECTIONS.

ALL POWER CONNECTIONS MUST BE COMPLETED BY A LICENSED ELECTRICIAN EXPERIENCED IN WIRING UPS EQUIPMENT, AND IN ACCORDANCE WITH ALL APPLICABLE NATIONAL AND LOCAL ELECTRICAL CODES.

IMPROPER WIRING MAY CAUSE DAMAGE TO THE UPS OR INJURY TO PERSONNEL.

CAUTION

All shielded cables, non-shielded cables, non-shielded control wires, non-shielded battery breaker control wires, and non-shielded remote control wires must be housed in individual, separate, steel conduits. Placing multiple cables in the same conduit with other control or power wiring may cause system failure.

Refer to the drawings in this manual and any other drawings provided by Liebert for this installation. Make all of the following connections:

1. AC power cables from input power source circuit breaker (RIB) to UPS Module Input. Observe phase rotation.
2. AC power cables from bypass power source circuit breaker (BIB) to UPS system bypass input at System Control Cabinet (SCC). Observe phase rotation.
3. AC power cables from UPS Module Outputs to SCC or to switchgear for critical load bus. Observe phase rotation.
4. Each UPS Module Output Neutral to SCC or to switchgear for critical load bus.
5. The UPS System Output Neutral is connected to one common point and solidly grounded per requirements of the National Electrical Code. The ground connection inside the UPS SCC cabinet may be required by the power wiring configuration at your site.

CAUTION

UPS bypass and system output neutral must be connected to only one common point in the UPS system. This neutral line must be grounded at the source.

6. DC power cables (and ground) from battery to Module Battery Disconnect (MBD) circuit breaker, and then to UPS Module DC bus. Observe polarity. DC power cables should be installed in conduit with conductors in matched pairs (positive and negative).
7. Module Battery Disconnect control wiring to UPS Module. Module Battery Disconnect control wiring must be housed in individual separate steel conduit. Do not run in power circuit conduit.
8. Control wiring from System Control Cabinet (SCC) to UPS modules. Wiring must be run in individual separate steel conduit.
9. Power and control connections required for the Maintenance Bypass Switchboard.
10. Power connections from SCC to critical load bus. Observe phase rotation.
11. Control wiring to Remote Monitor Panel, if used. Selected alarm messages are also available for customer use through a set of contacts on a separate terminal board. Wiring must be run in individual separate steel conduit.
12. Emergency Power Off control wiring (to SCC) must be run in separate steel conduit.
13. Communications wiring (to SCC) for terminals, site monitoring, or modem must be run in separate steel conduit.
14. Any additional special wiring required at your site.

9.0 WIRING INSPECTION

1. Verify all power connections are tight.
2. Verify all control wire terminations are tight.
3. Verify all power wires and connections have proper spacing between exposed surfaces, phase-to-phase and phase-to-ground.
4. Verify that all control wires are run in individual, separate, steel conduit.

Table 1 Power Wiring Terminals - Factory Supplied

Connection Type					
UPS Module Rating kVA	**AC Input**	**AC Output**	**Battery**	**Neutral**	**Ground**
338 - 1000	Lugs on circuit breakers, or bus bars (for field supplied lugs). Refer to installation drawings.		Bus bars for connecting hardware (1/2” on 1-3/4” centers) are provided. A field supplied lug is required.		
Use 75°C copper wire. Select wire size based on the ampacities in **Table 310-16** (see **Table 3** of this manual) and associated notes of the National Electrical Code (NFPA 70).					
Use commercially available solderless lugs for the wire size required for your application. Connect wire to the lug using tool and procedure specified by the lug manufacturer.					

Table 2 Torque Specifications

Nut and Bolt Combinations				
	Grade 2 Standard		**Electrical Connections with Belleville Washers**	
Bolt Shaft Size	**Lb-in**	**N-m**	**Lb-in**	**N-m**
1/4	53	6.0	46	5.2
5/16	107	12	60	6.8
3/8	192	22	95	11
1/2	428	48	256	29

Circuit Breakers With Compression Lugs (For Power Wiring)		
Current Rating	**Lb-in**	**N-m**
400 - 1200 Amps	300	34

Terminal Block Compression Lugs (For Control Wiring)		
AWG Wire Size or Range	**Lb-in**	**N-m**
#22 - #14	3.5 to 5.3	0.4 to 0.6

Use the values in this table unless the equipment is labeled with a different torque value.

Table 3 Table 310-16

Allowable Ampacities of Insulated Conductors Rated 0-2000 Volts, 60° to 90°C (140° to 194°F)[1]

Not More than Three Conductors in Raceway or Cable or Earth (Directly Buried), based on Ambient Temperature of 30° (86°F)

Size	Temperature Rating of Conductor. See Table 310-13.						Size
AWG kcmil	60°C (140°F)	75°C (167°F)	90°C (194°F)	60°C (140°F)	75°C (167°F)	90°C (194°F)	AWG kcmil
	Types TW† UF†	**Types** FEPW+, RH,RHW†, THHW†, THW†, THWN†, XHHW†, USE†, ZW†	**Types** TBS, SA, SIS,FEP†, FEPB†,MI, RHH†, RHW-2 THHN†,THHW†, THW-2,THWN-2, USE-2, XHH, XHHW† XHHW-2,ZW-2	**Types** TW† UF†	**Types** RH†, RHW†, THHW†, THW†, THWN†, XHHW†, USE†	**Types** TBS, SA,SIS, THHN†, THHW†, THW-2, THWN-2, RHH†, RHW-2, USE-2, XHH, XHHW†, XHHW-2, ZW-2	
	Copper			**Aluminum or Copper-Clad Aluminum**			
18			14				....
16			18				....
14	20†	20†	25†				....
12	25†	25†	30†	20†	20†	25†	12
10	30	35†	40†	25	30†	35†	10
8	40	50	55	30	40	45	8
6	55	65	75	40	50	60	6
4	70	85	95	55	65	75	4
3	85	100	110	65	75	85	3
2	95	115	130	75	90	100	2
1	110	130	150	85	100	115	1
1/0	125	150	170	100	120	135	1/0
2/0	145	175	195	115	135	150	2/0
3/0	165	200	225	130	155	175	3/0
4/0	195	230	260	150	180	205	4/0
250	215	255	290	170	205	230	250
300	240	285	320	190	230	255	300
350	260	310	350	210	250	280	350
400	280	335	380	225	270	305	400
500	320	380	430	260	310	350	500
600	355	420	475	285	340	385	600
700	385	460	520	310	375	420	700
750	400	475	535	320	385	435	750
800	410	490	555	330	395	450	800
900	435	520	585	355	425	480	900
1000	455	545	615	375	445	500	1000
1250	495	590	665	405	485	545	1250
1500	520	625	705	435	520	585	1500
1750	545	650	735	455	545	615	1750
2000	560	665	750	470	560	630	2000
Correction Factors							
Ambient Temp °C	**For ambient temperatures other than 30°C (86°F), multiply the allowable ampacities shown above by the appropriate factor shown below.**						**Ambient Temp °F**
21-25	1.08	1.05	1.04	1.08	1.05	1.04	70-77
26-30	1.00	1.00	1.00	1.00	1.00	1.00	78-86
31-35	.91	.94	.96	.91	.94	.96	87-95
36-40	.82	.88	.91	.82	.88	.91	96-104
41-45	.71	.82	.87	.71	.82	.87	105-113
46-50	.58	.75	.82	.58	.75	.82	114-122
51-55	.41	.67	.76	.41	.67	.76	123-131
56-60		.58	.71		.58	.71	132-140
61-70		.33	.58		.33	.58	141-158
71-80			.41			.41	159-176

† Unless otherwise specifically permitted elsewhere in this Code, the overcurrent protection for conductor types marked with an obelisk (†) shall not exceed 15 amperes for No. 14, 20 amperes for No. 12, and 30 amperes for No. 10 copper; or 15 amperes for No. 12 and 25 amperes for No. 10 aluminum and copper-clad aluminum after any correction factors for ambient temperature and number of conductors have been applied.

[1] Reprinted with permission from NFPA 70-1993, the National Electrical Code®, Copyright 1996, National Fire Protection Association, Quincy, MA 02269. This reprinted material is not the complete and official position of the National Fire Protection Association, on the referenced subject which is represented only by the standard in its entirety.

Figure 5 Outline Drawing, 338 kVA

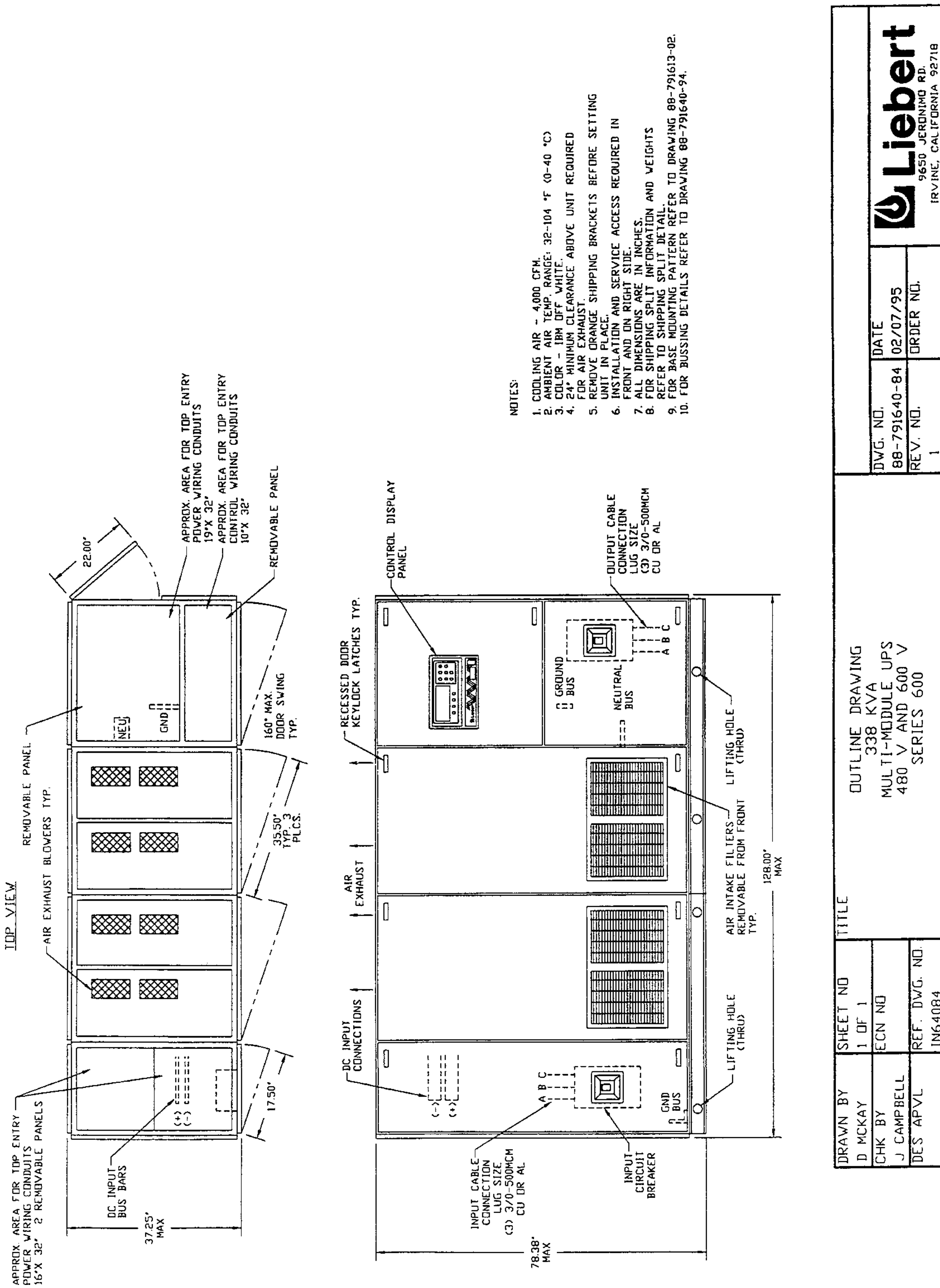


Figure 6   Outline Drawing, 400 kVA

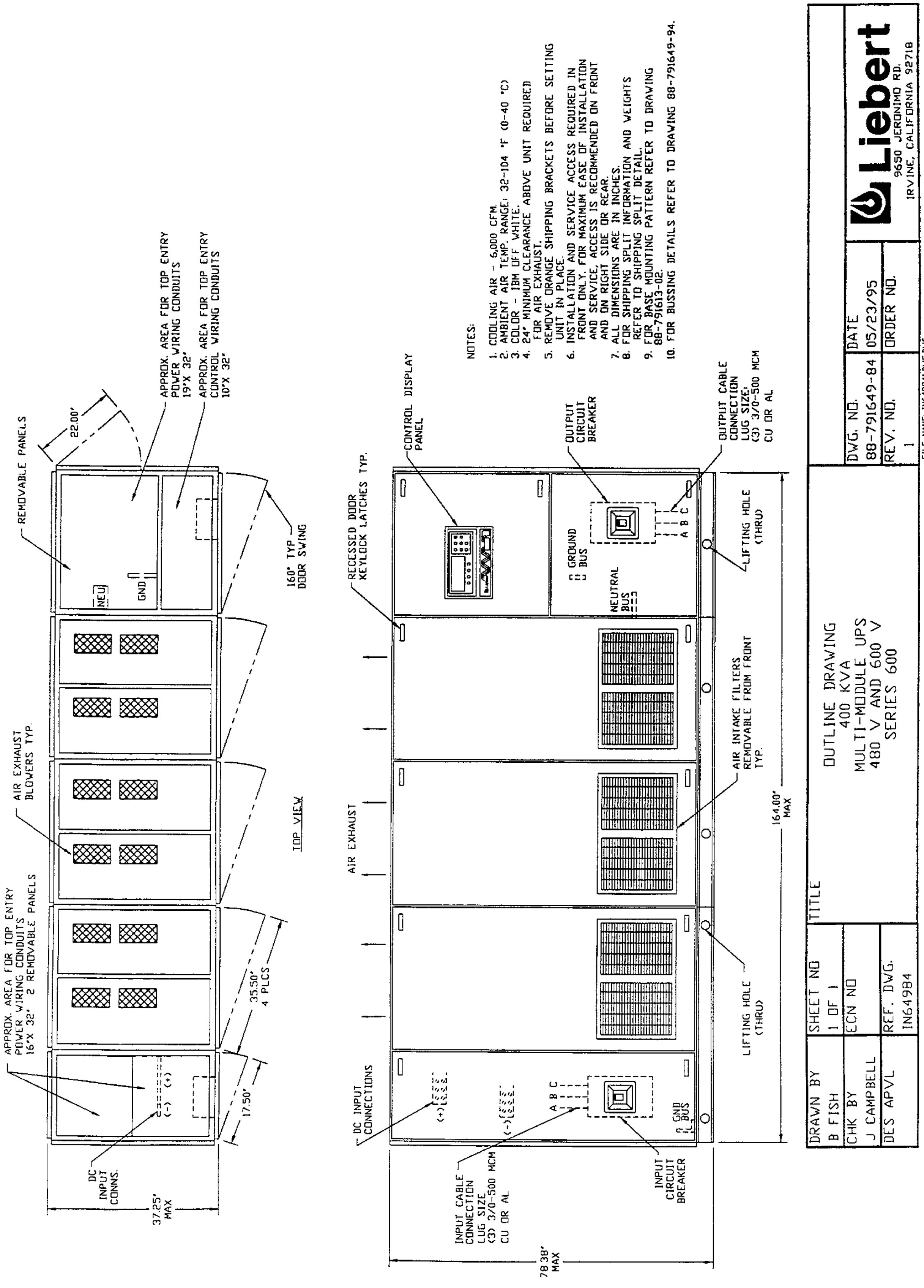


Figure 7 Outline Drawing, 500 kVA

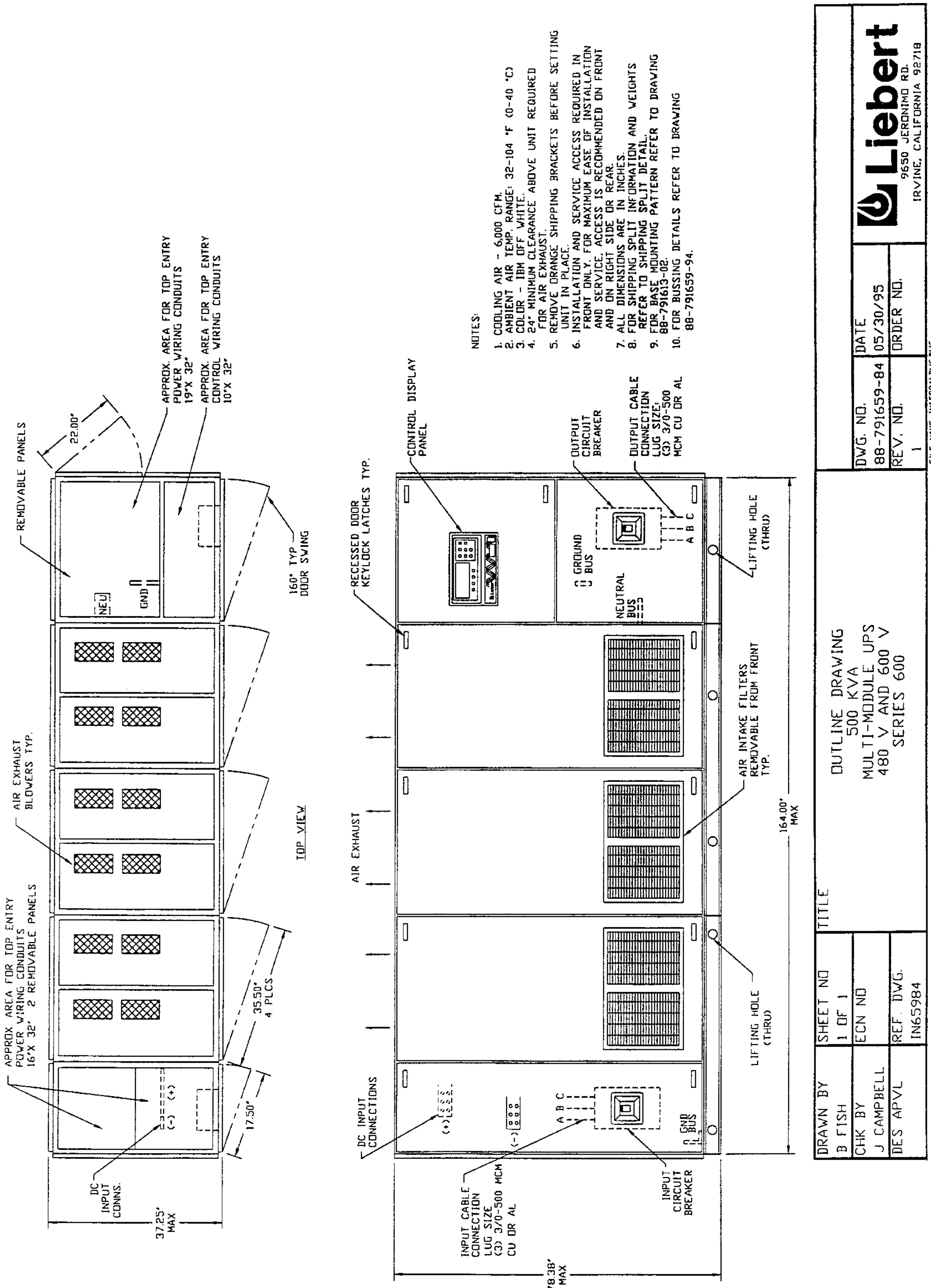


Figure 8 Outline Drawing, 500 kVA, 208 VAC

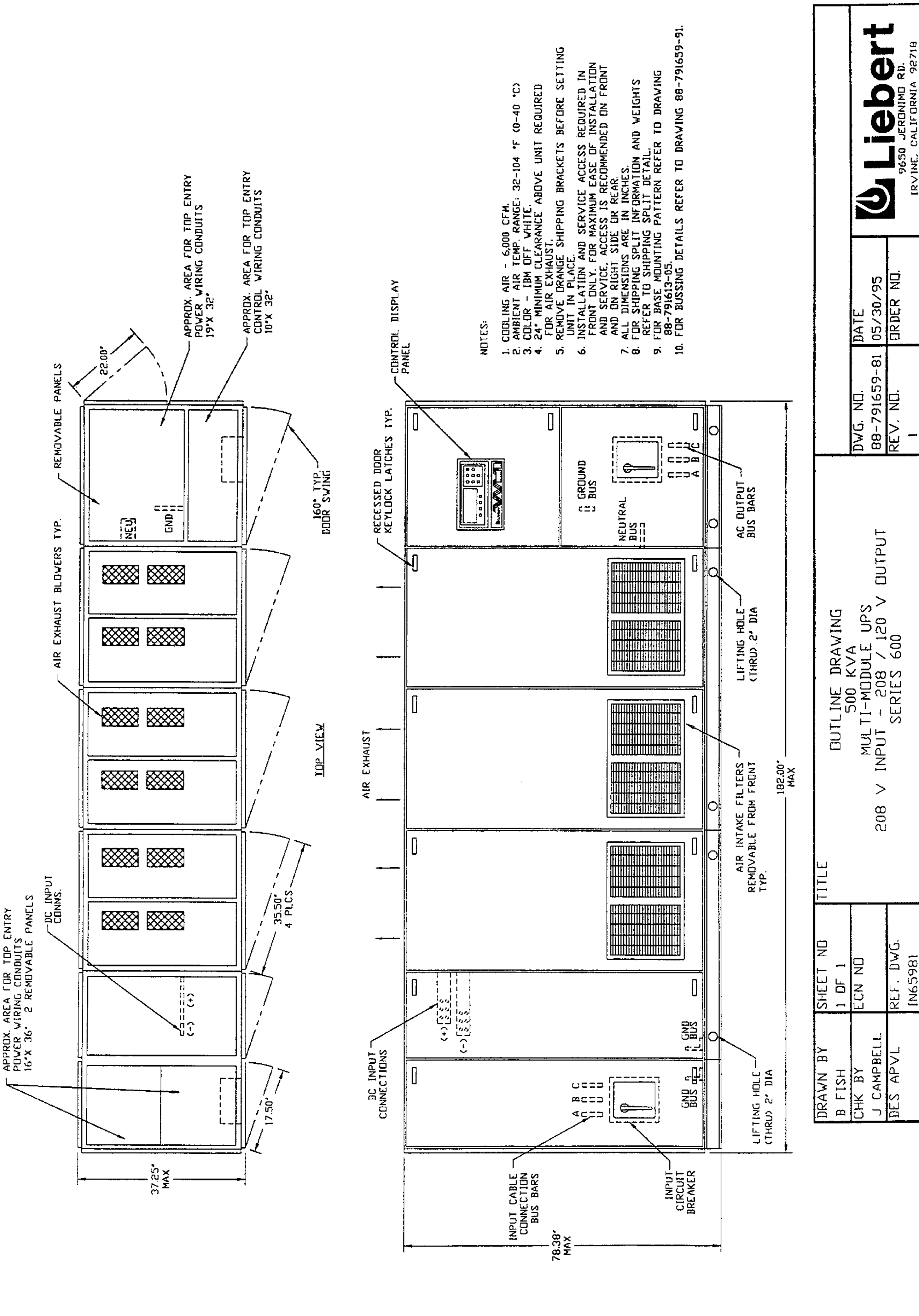


Figure 9 Outline Drawing, 625 kVA

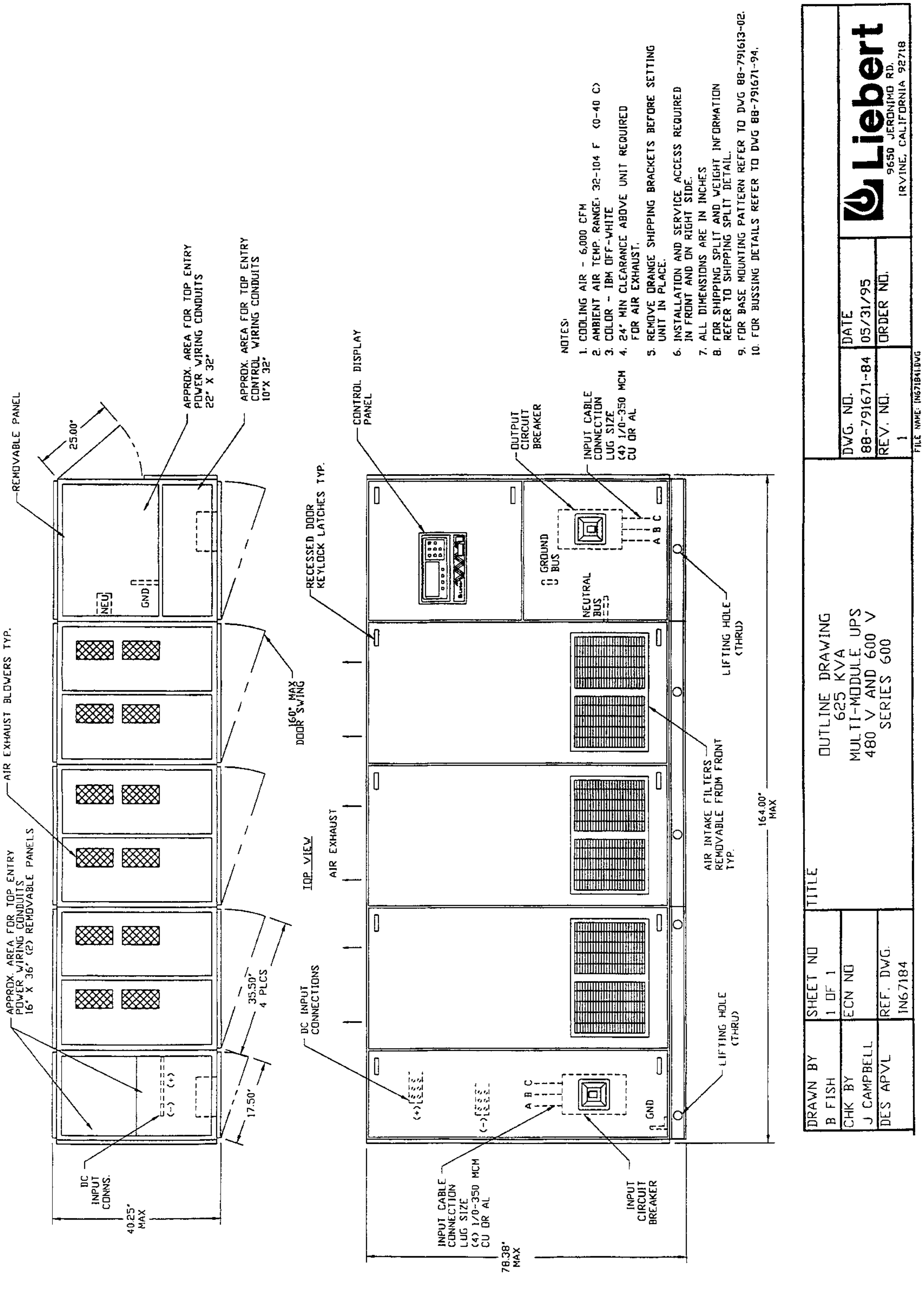


Figure 10 Outline Drawing, 750 kVA (High Link - 240 Cells)

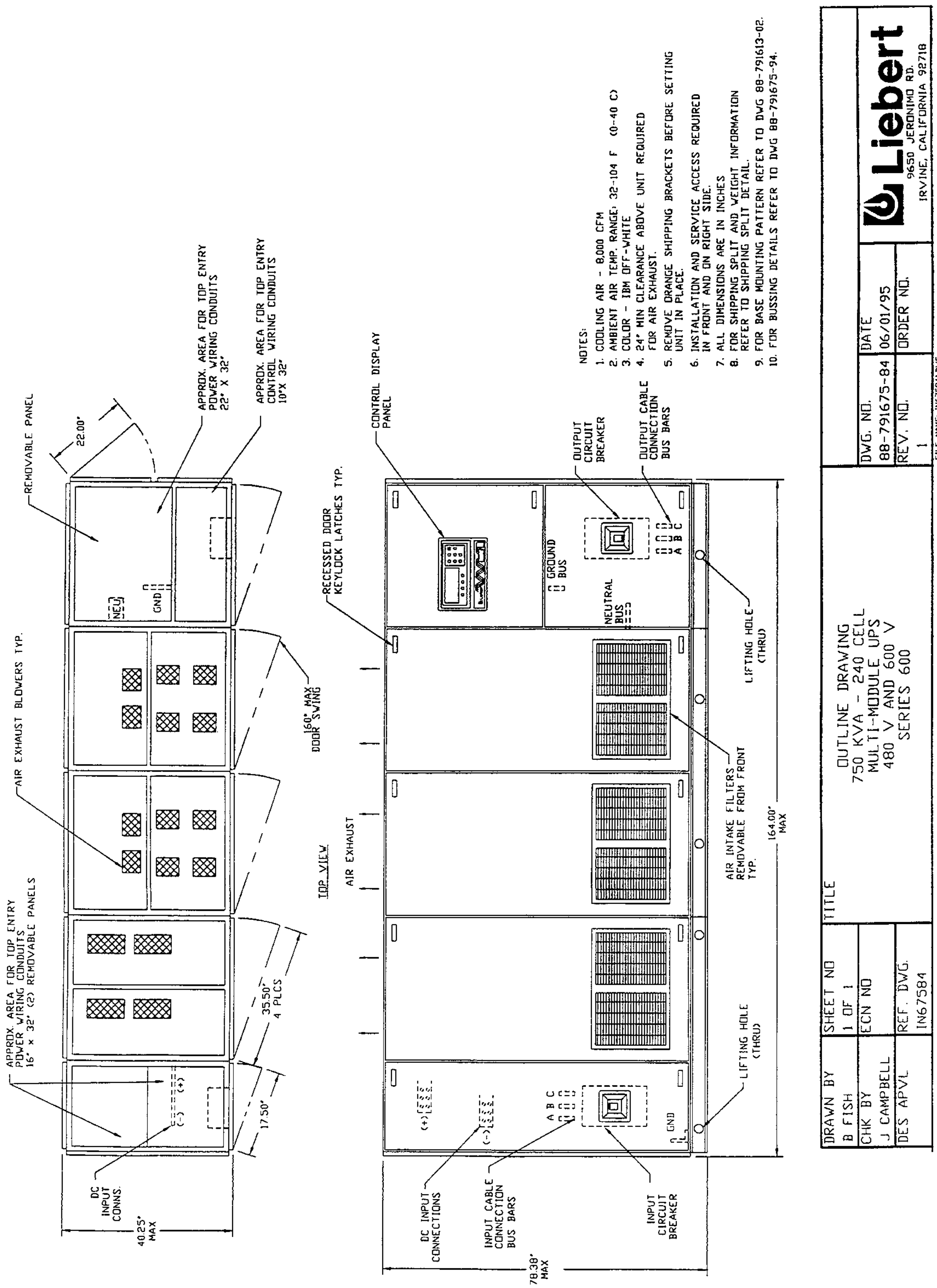


Figure 11 Outline Drawing, 750 kVA (Low Link - 180 Cells)

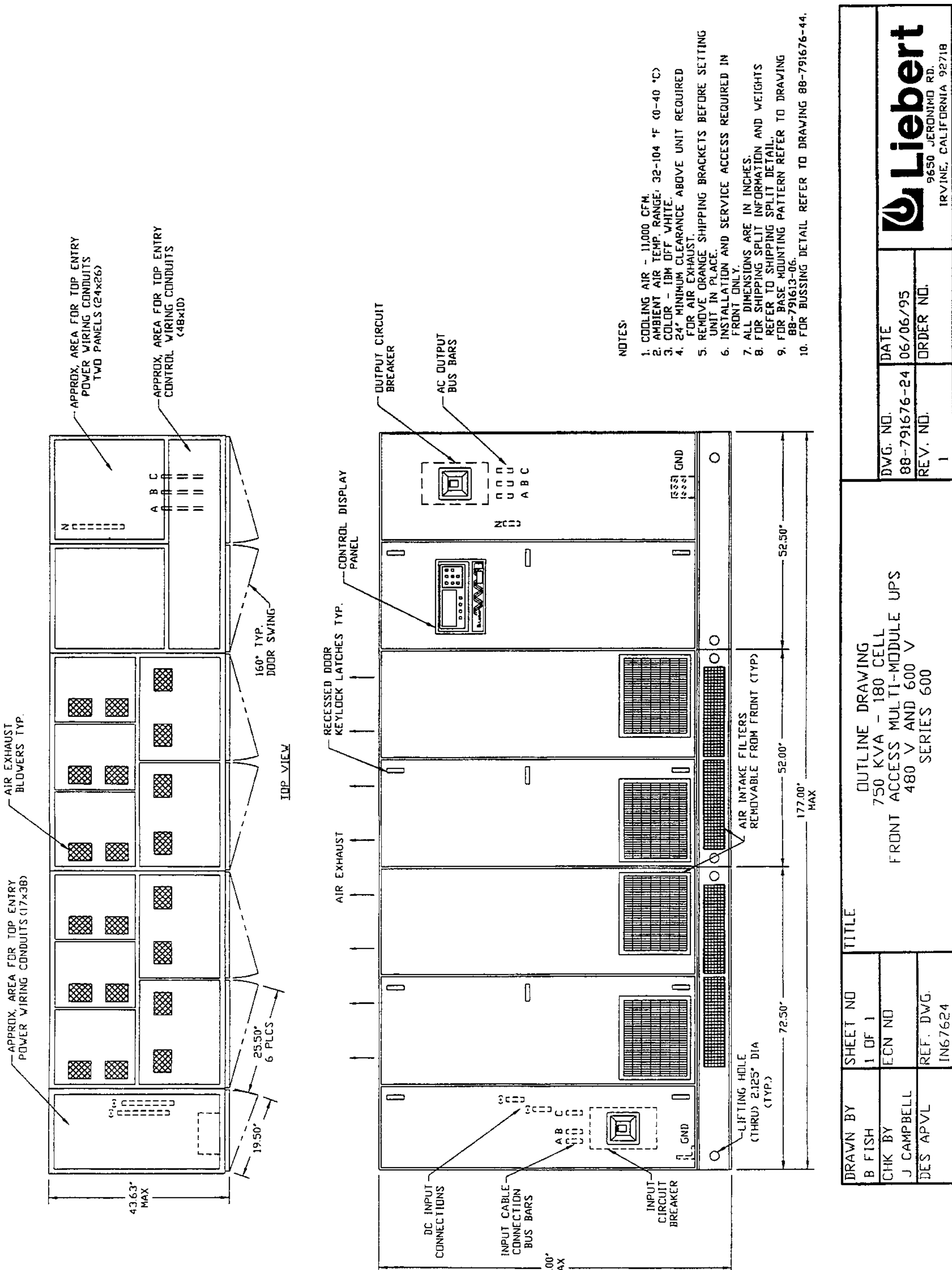


Figure 12 Outline Drawing, 1000 kVA

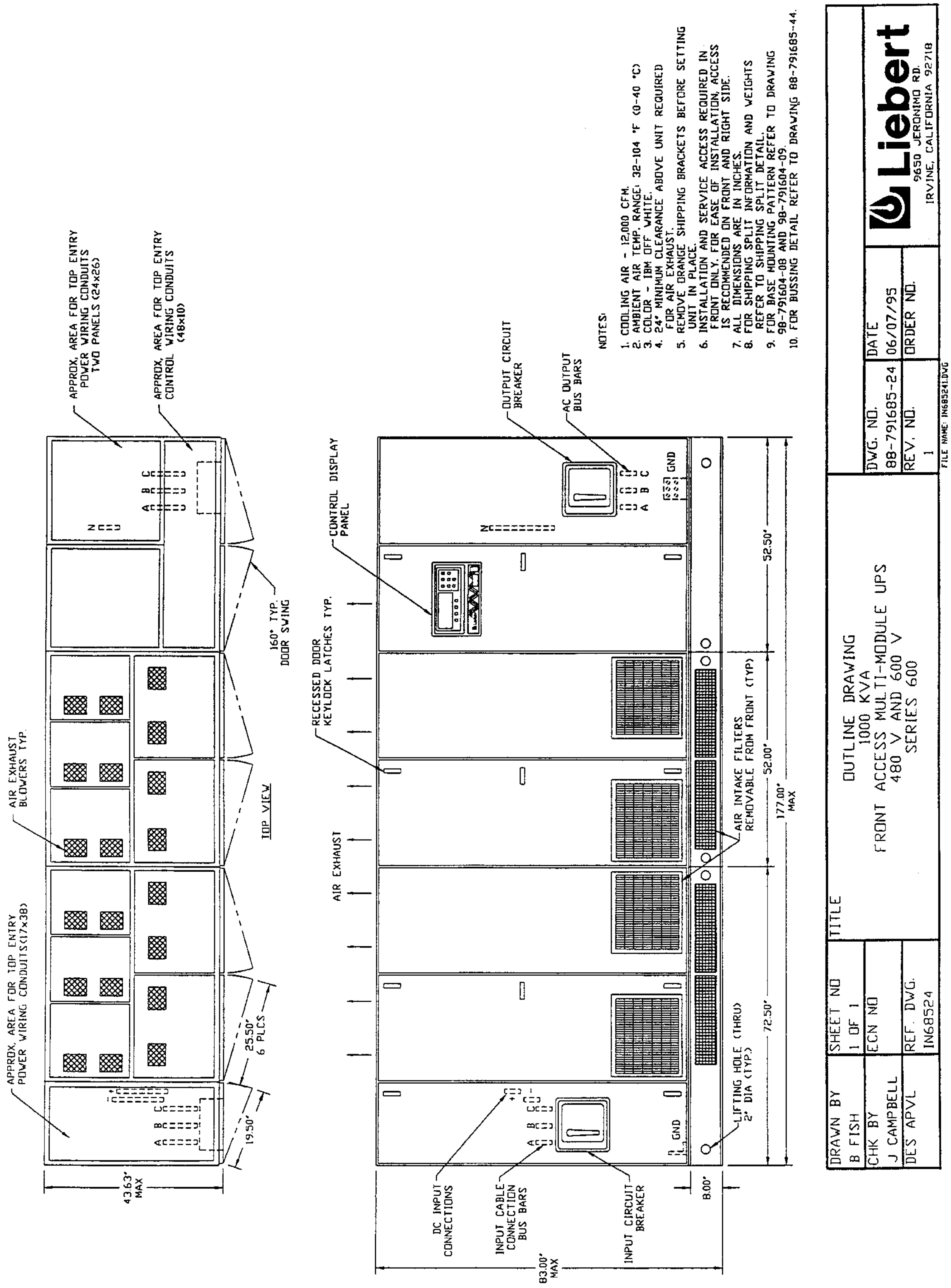


Figure 13 Outline Drawing, System Control Cabinet (SCCB) 640 to 800 Amps

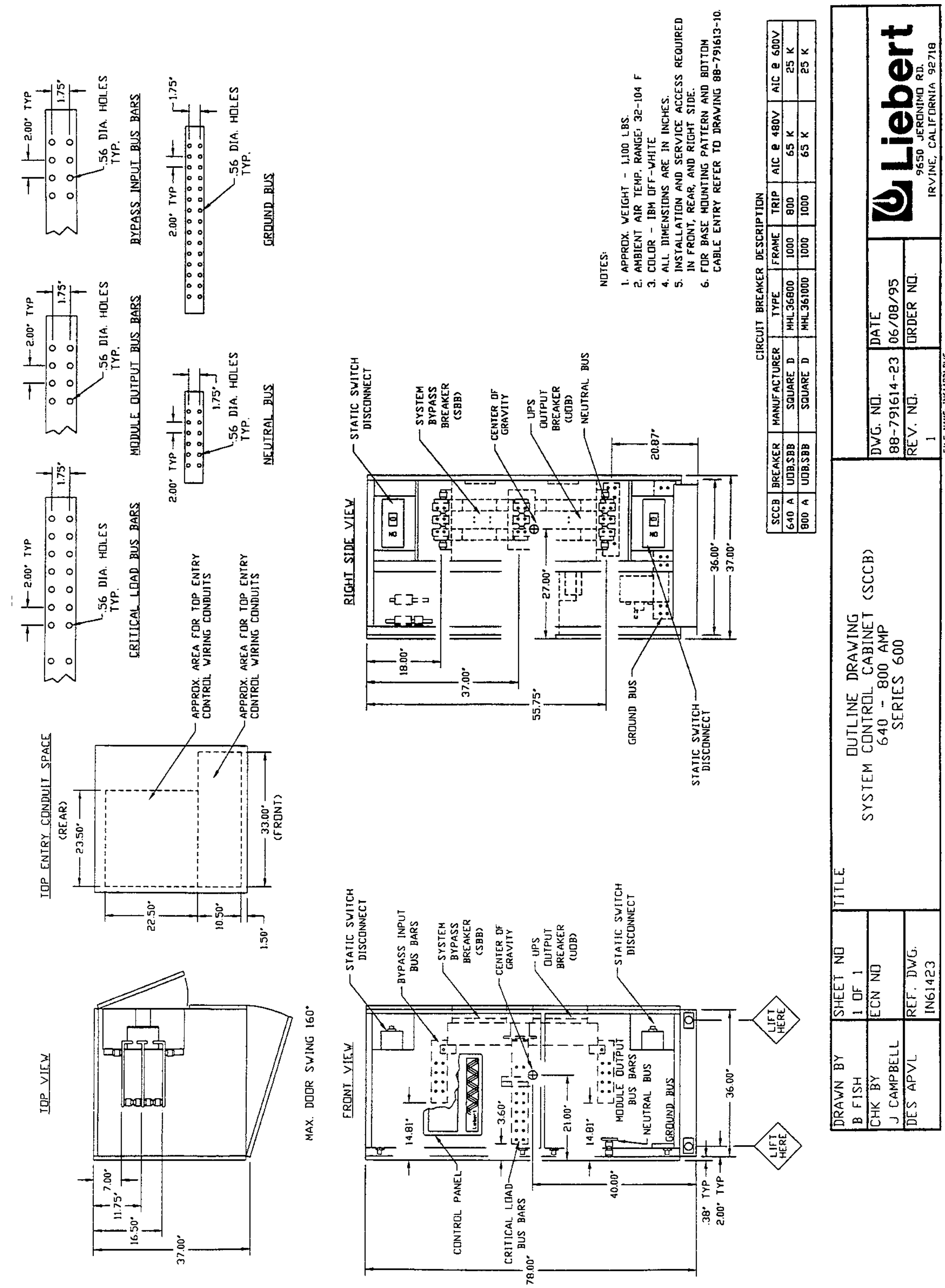


Figure 14 Outline Drawing, System Control Cabinet (SCCB) 1280 to 1600 Amps

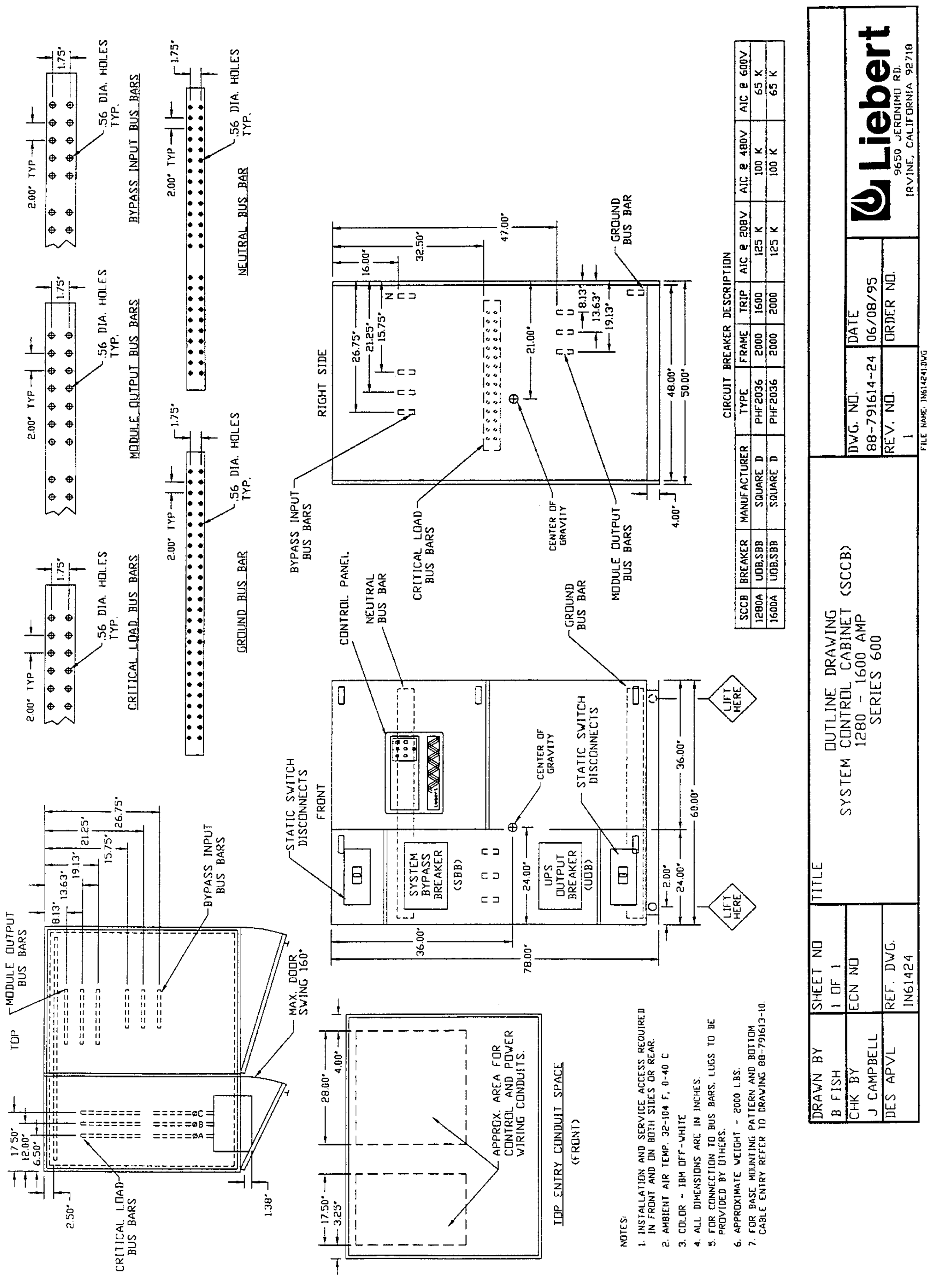
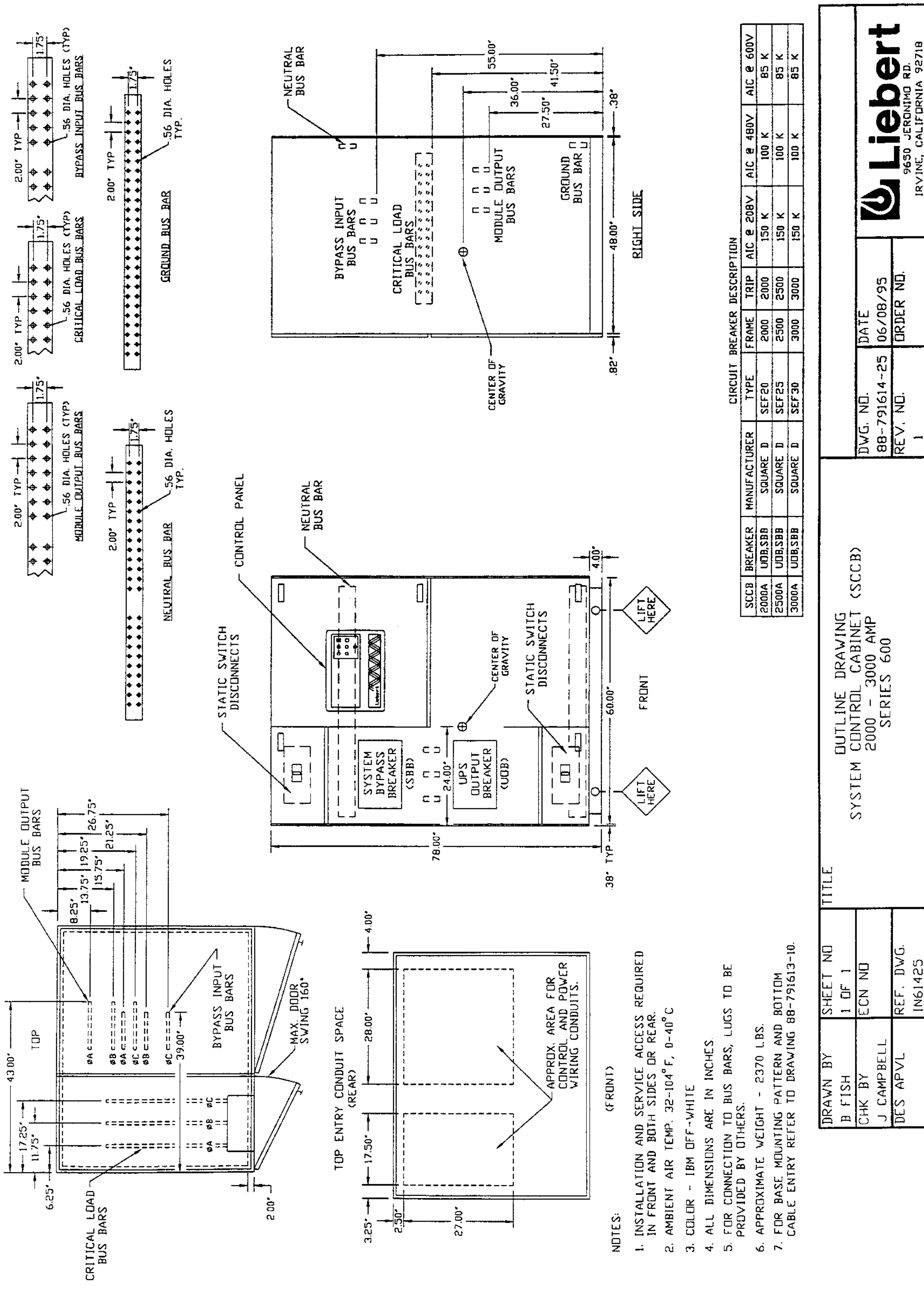


Figure 15 Outline Drawing, System Control Cabinet (SCCB) 2000 to 3000 Amps



SCCB	BREAKER	MANUFACTURER	TYPE	FRAME	TRIP	AIC @ 208V	AIC @ 480V	AIC @ 600V
2000A	UOB,SBB	SQUARE D	SEF20	2000	2000	150 K	100 K	85 K
2500A	UOB,SBB	SQUARE D	SEF25	2500	2500	150 K	100 K	85 K
3000A	UOB,SBB	SQUARE D	SEF30	3000	3000	150 K	100 K	85 K

NOTES:

1. INSTALLATION AND SERVICE ACCESS REQUIRED IN FRONT AND BOTH SIDES OR REAR.
2. AMBIENT AIR TEMP. 32-104°F, 0-40°C
3. COLOR - IBM OFF-WHITE
4. ALL DIMENSIONS ARE IN INCHES
5. FOR CONNECTION TO BUS BARS, LUGS TO BE PROVIDED BY OTHERS.
6. APPROXIMATE WEIGHT - 2370 LBS.
7. FOR BASE MOUNTING PATTERN AND BOTTOM CABLE ENTRY REFER TO DRAWING 88-791613-10.

DRAWN BY: B FISH	SHEET NO: 1 OF 1	TITLE: SYSTEM OUTLINE DRAWING, CONTROL CABINET (SCCB) 2000 - 3000 AMP SERIES 600	
CHK BY: J CAMPBELL	ECN NO	DWG. NO.: 88-791614-25	DATE: 06/08/95
DES APVL	REF. DWG.: IN61425	REV. NO.: 1	ORDER NO.

Liebert, 9650 JERONIMO RD., IRVINE, CALIFORNIA 92718

FILE NAME: IN61425I.DWG

Figure 16 Outline Drawing, System Control Cabinet (SCCB) 4000 Amps

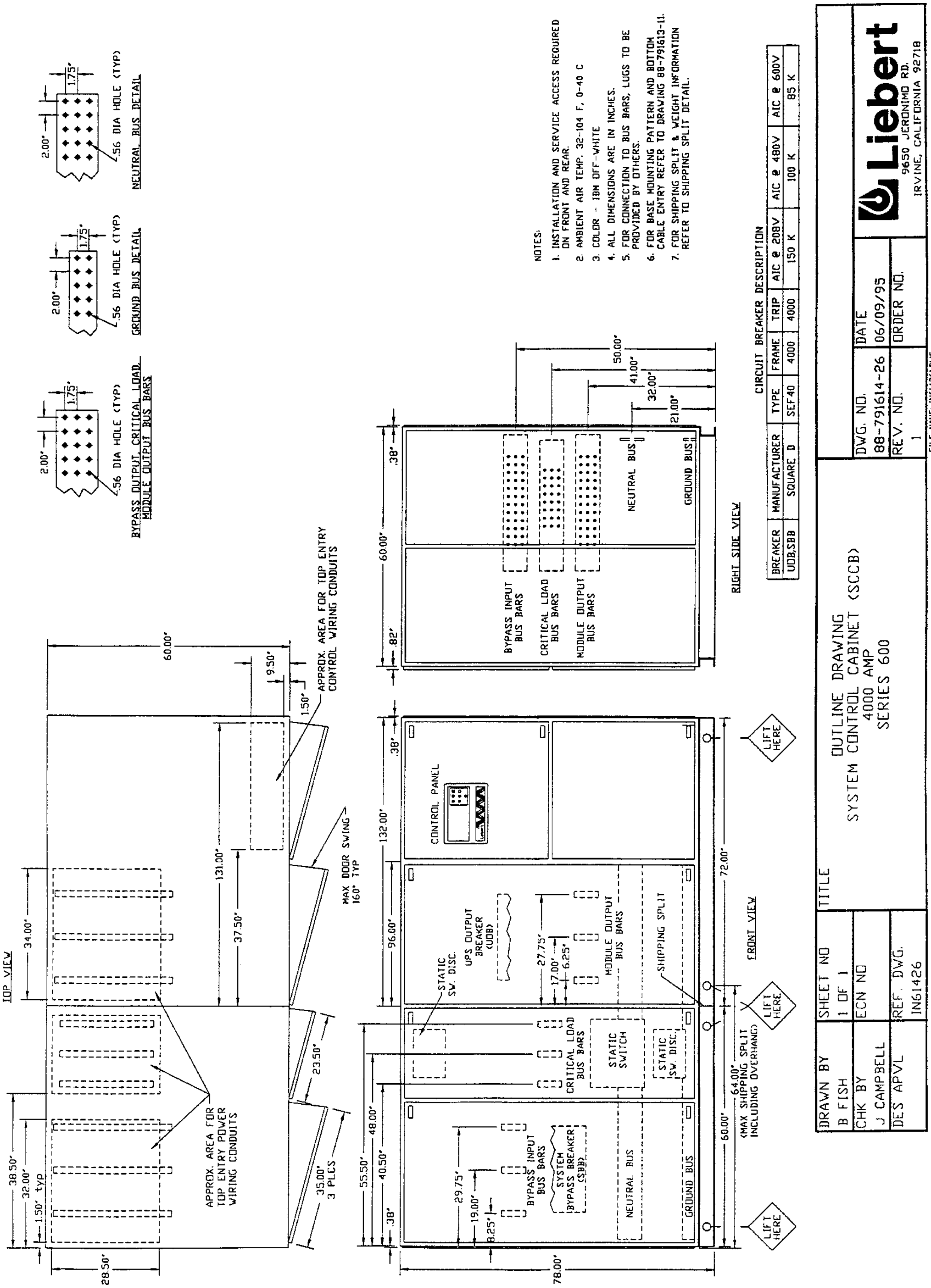
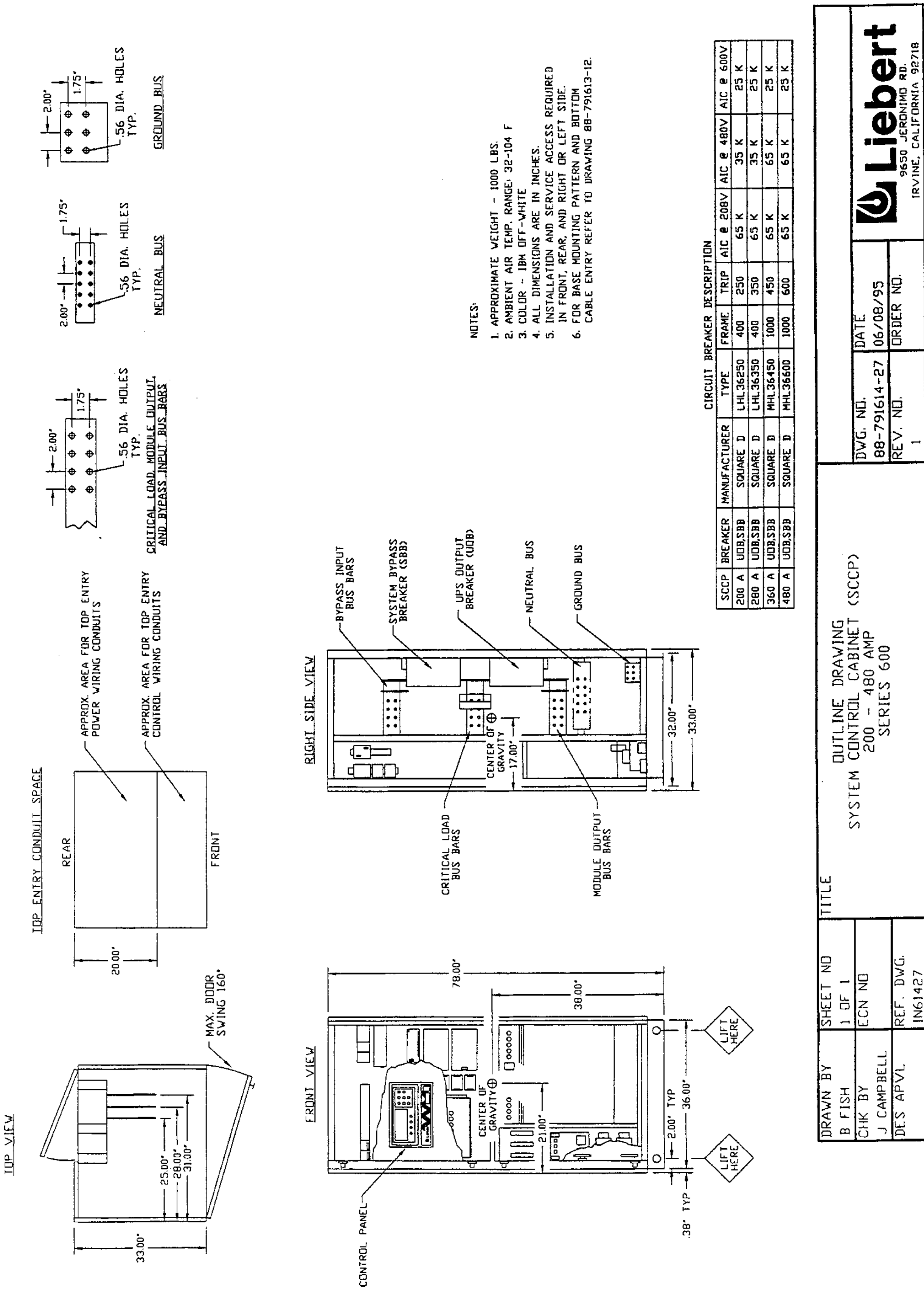


Figure 17 Outline Drawing, System Control Cabinet (SCCP) 200 to 480 Amps



CIRCUIT BREAKER DESCRIPTION

SCCP	BREAKER	MANUFACTURER	TYPE	FRAME	TRIP	AIC @ 208V	AIC @ 480V	AIC @ 600V
200 A	UOB,SBB	SQUARE D	LHL36250	400	250	65 K	35 K	25 K
280 A	UOB,SBB	SQUARE D	LHL36350	400	350	65 K	35 K	25 K
360 A	UOB,SBB	SQUARE D	MHL36450	1000	450	65 K	65 K	25 K
480 A	UOB,SBB	SQUARE D	MHL36600	1000	600	65 K	65 K	25 K

Figure 18 Outline Drawing, System Control Cabinet (SCCP) 560 to 960 Amps

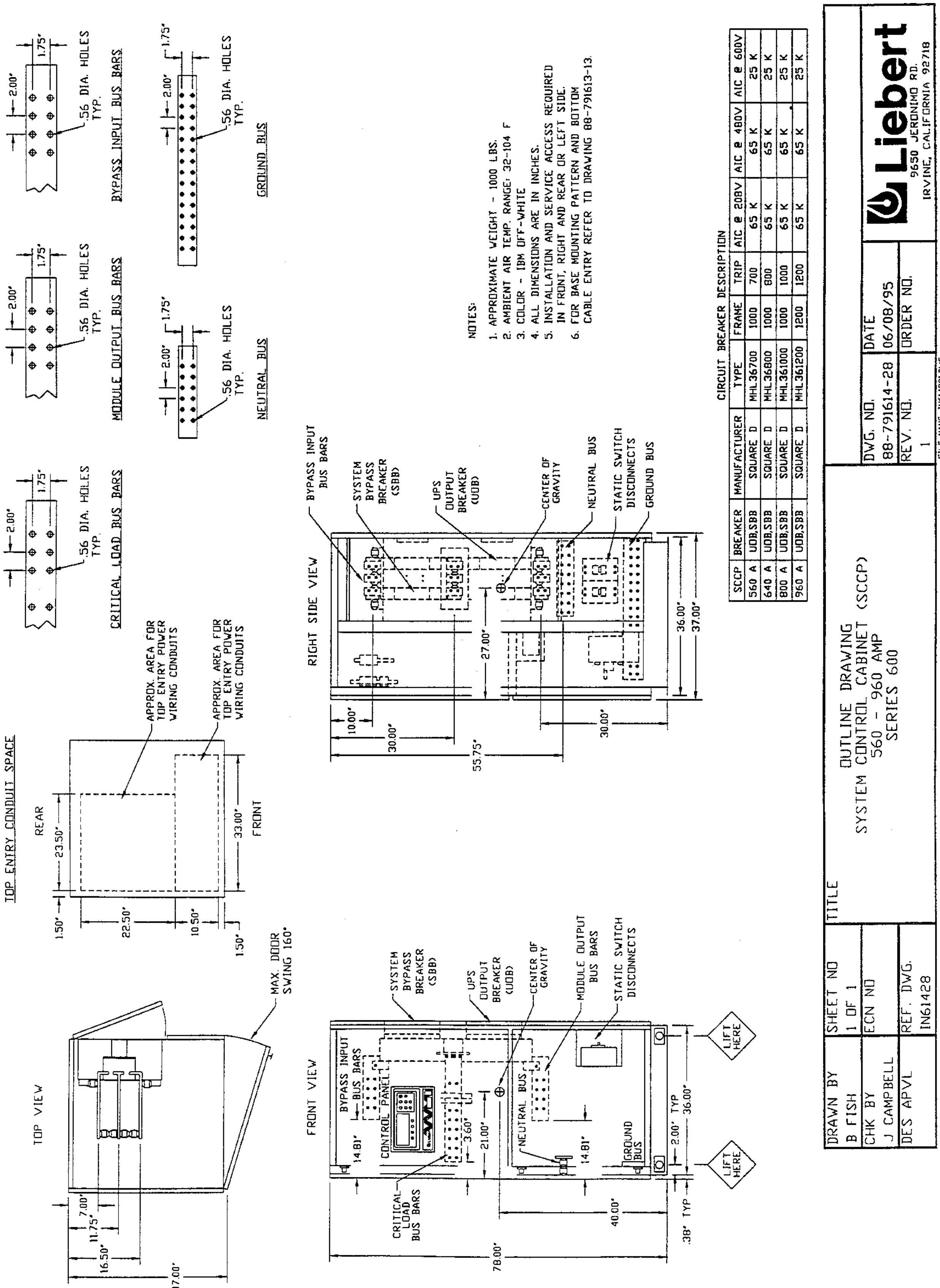


Figure 19 Outline Drawing, System Control Cabinet (SCCP) 1280 to 2000 Amps

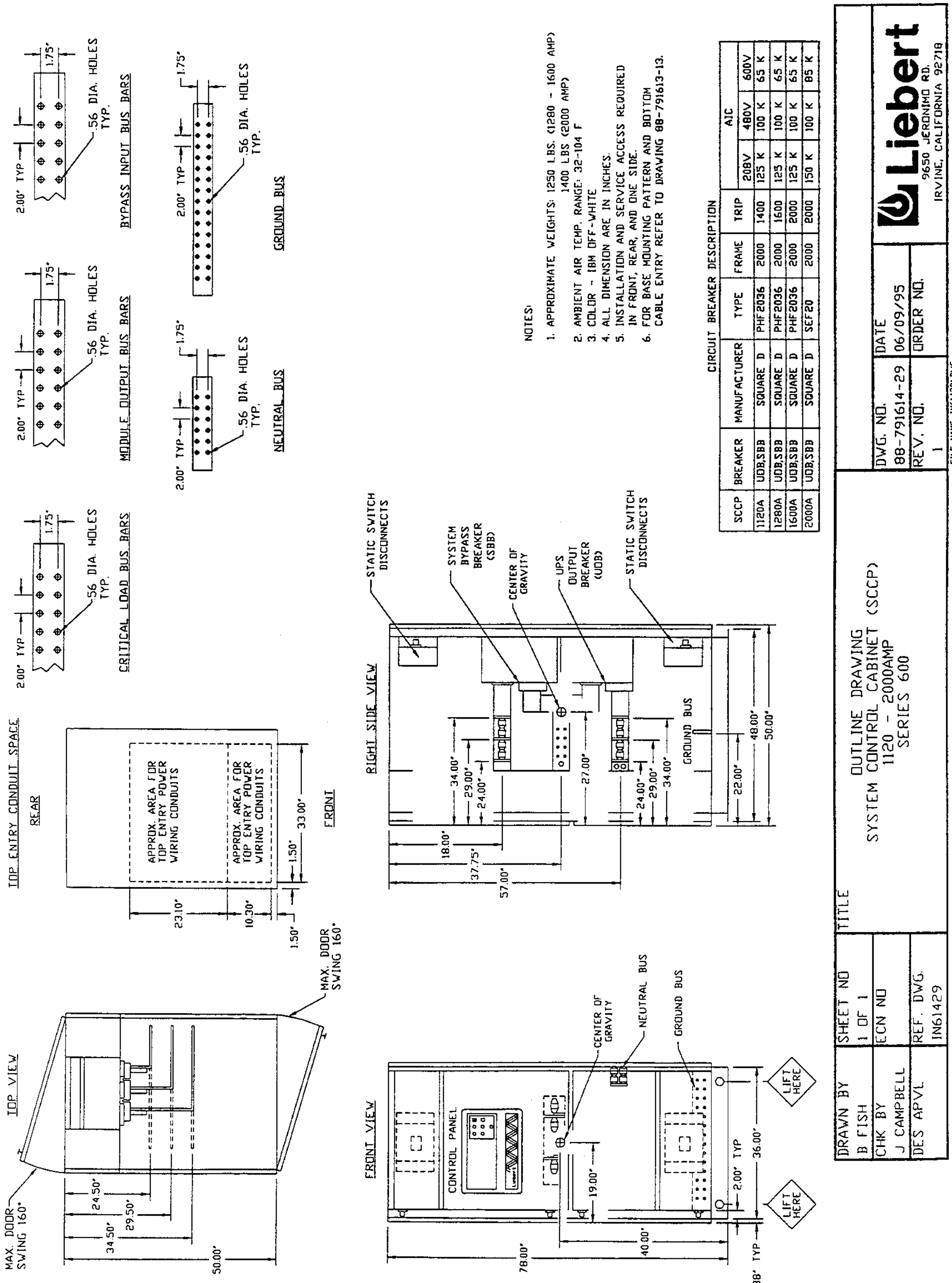


Figure 20 Outline Drawing, System Control Cabinet (SCCA) 2000 to 4000 Amps

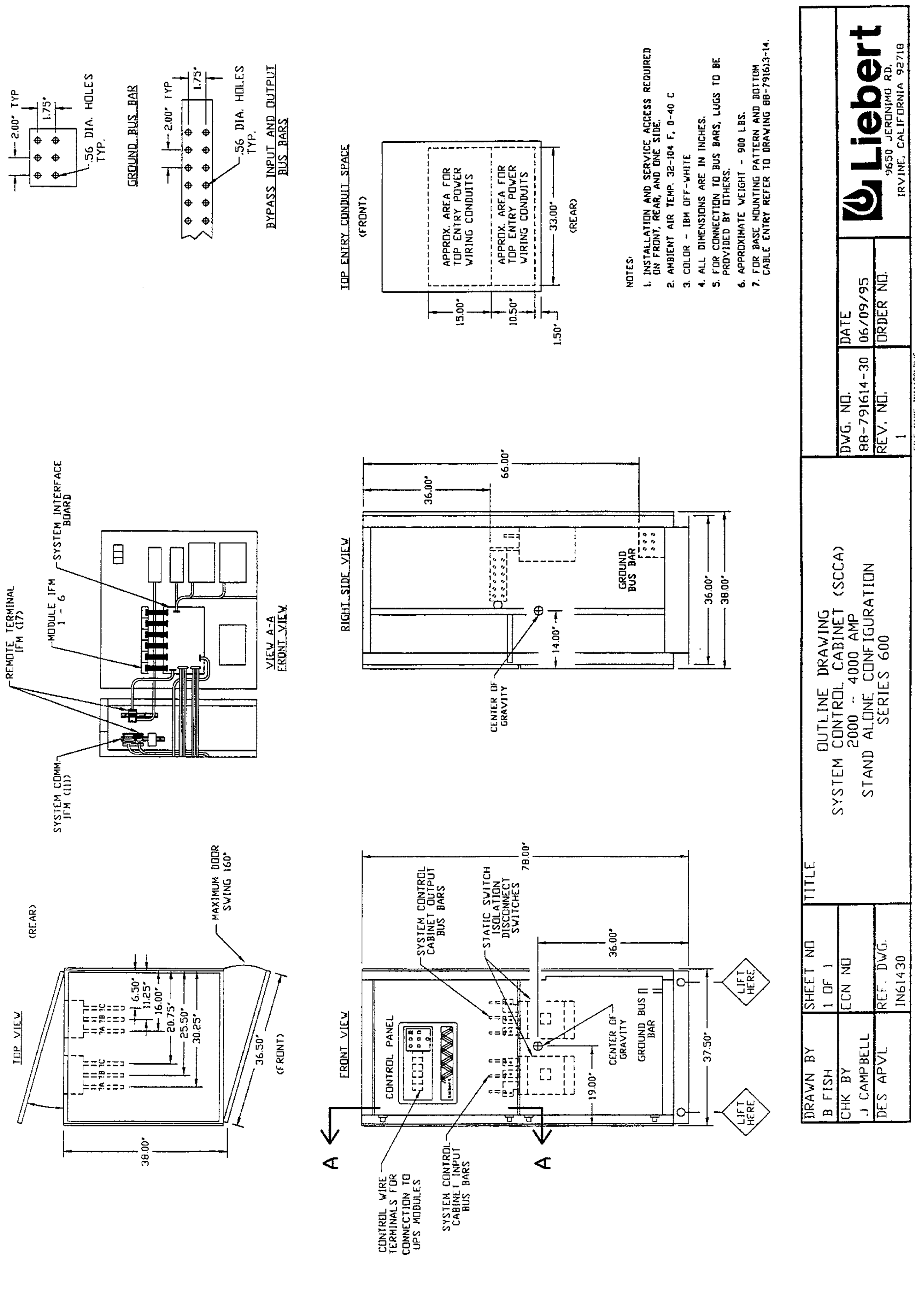


Figure 21 Base Mounting Details, 338 kVA

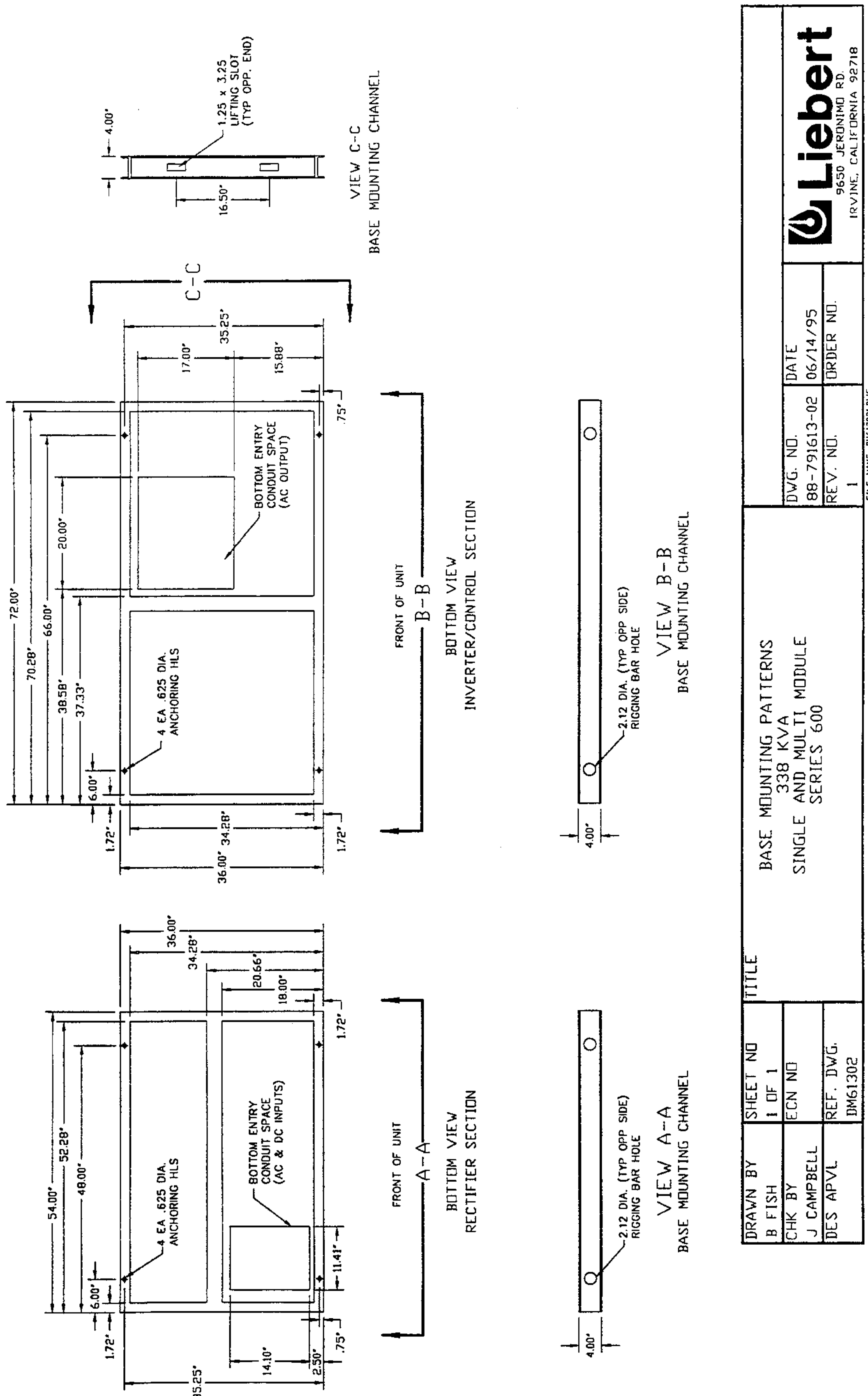


Figure 22 Base Mounting Details, 400 and 500 kVA

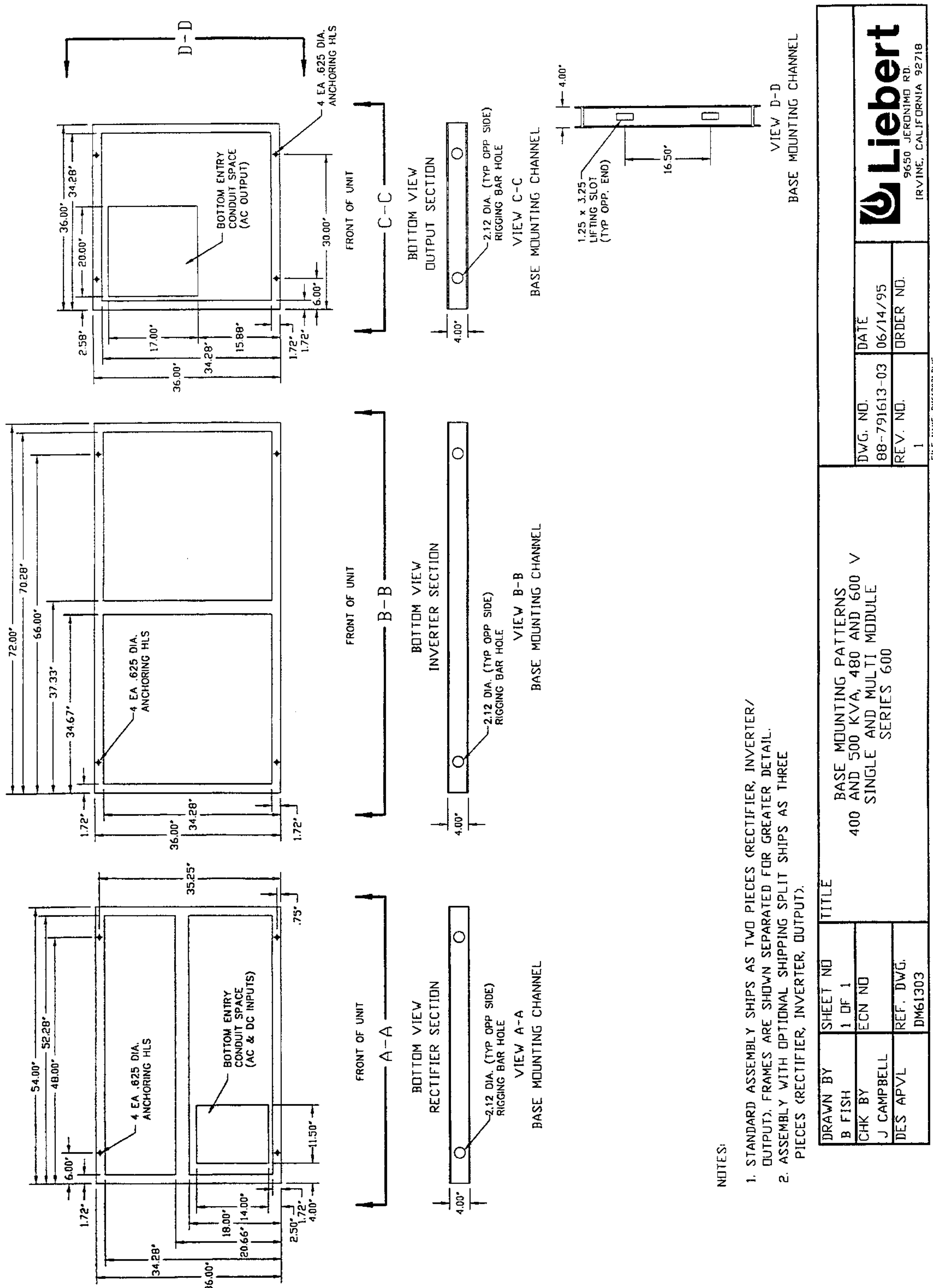


Figure 23 Base Mounting Details, 400 and 500 kVA, 208 VAC, Rectifier and Inverter Sections

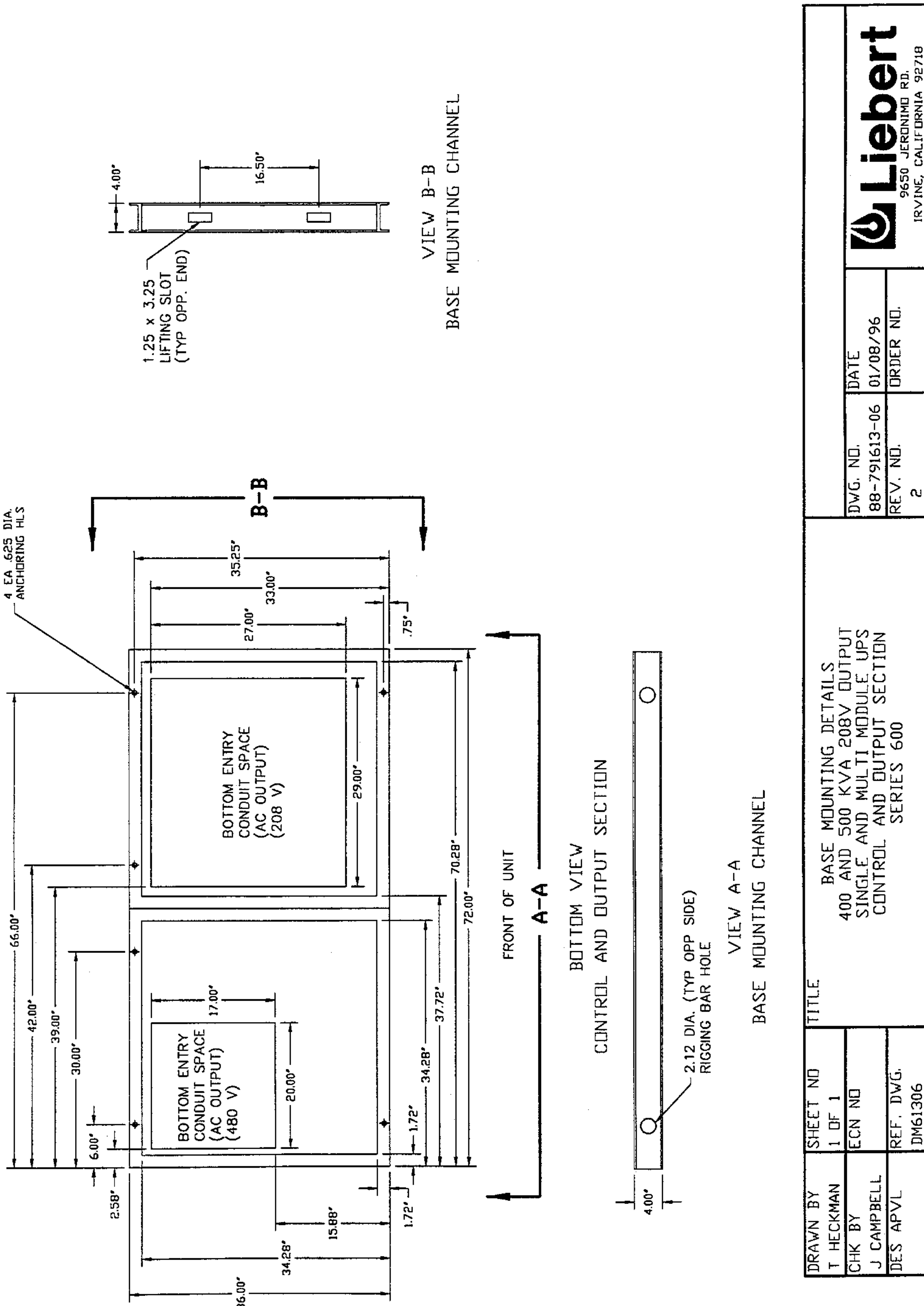


Figure 24 Base Mounting Details, 400 and 500 kVA, 208 VAC, Control and Output Sections

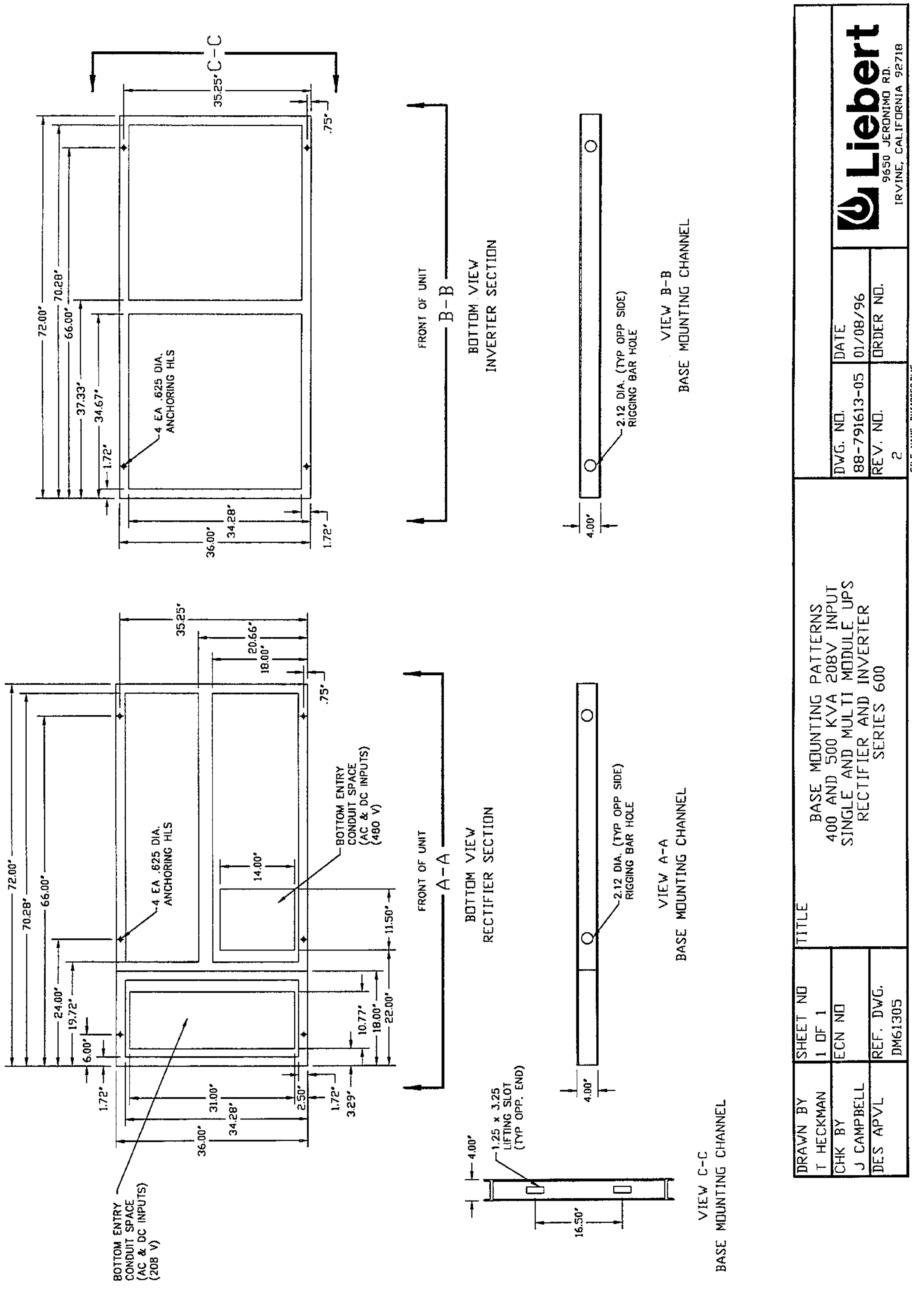


Figure 25 Base Mounting Details, 625 kVA and 750 kVA (High Link - 240 Cells)

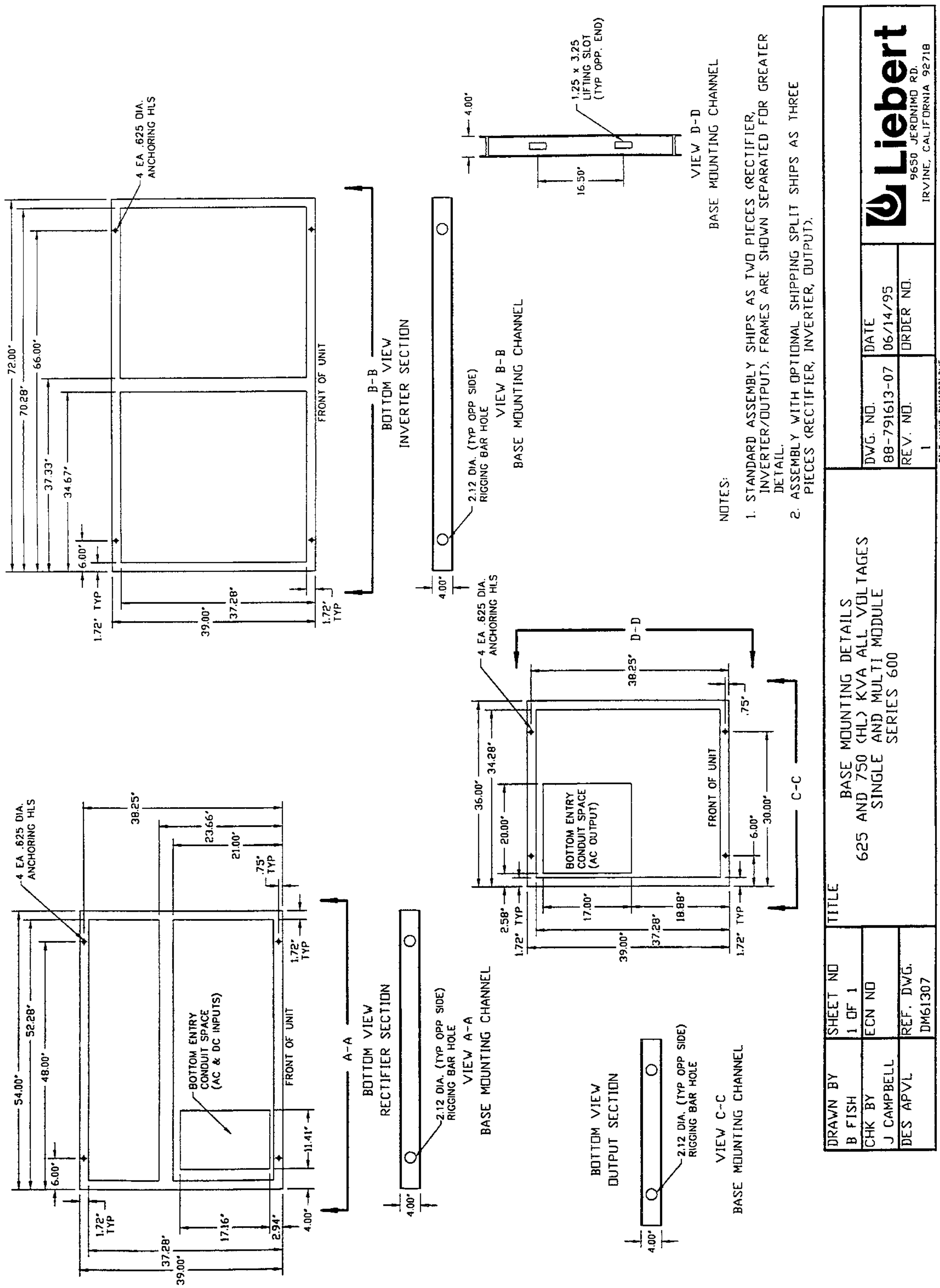


Figure 26 Base Mounting Details, 750 kVA (Low Link - 180 Cells) and 1000 kVA, Rectifier and Inverter Sections

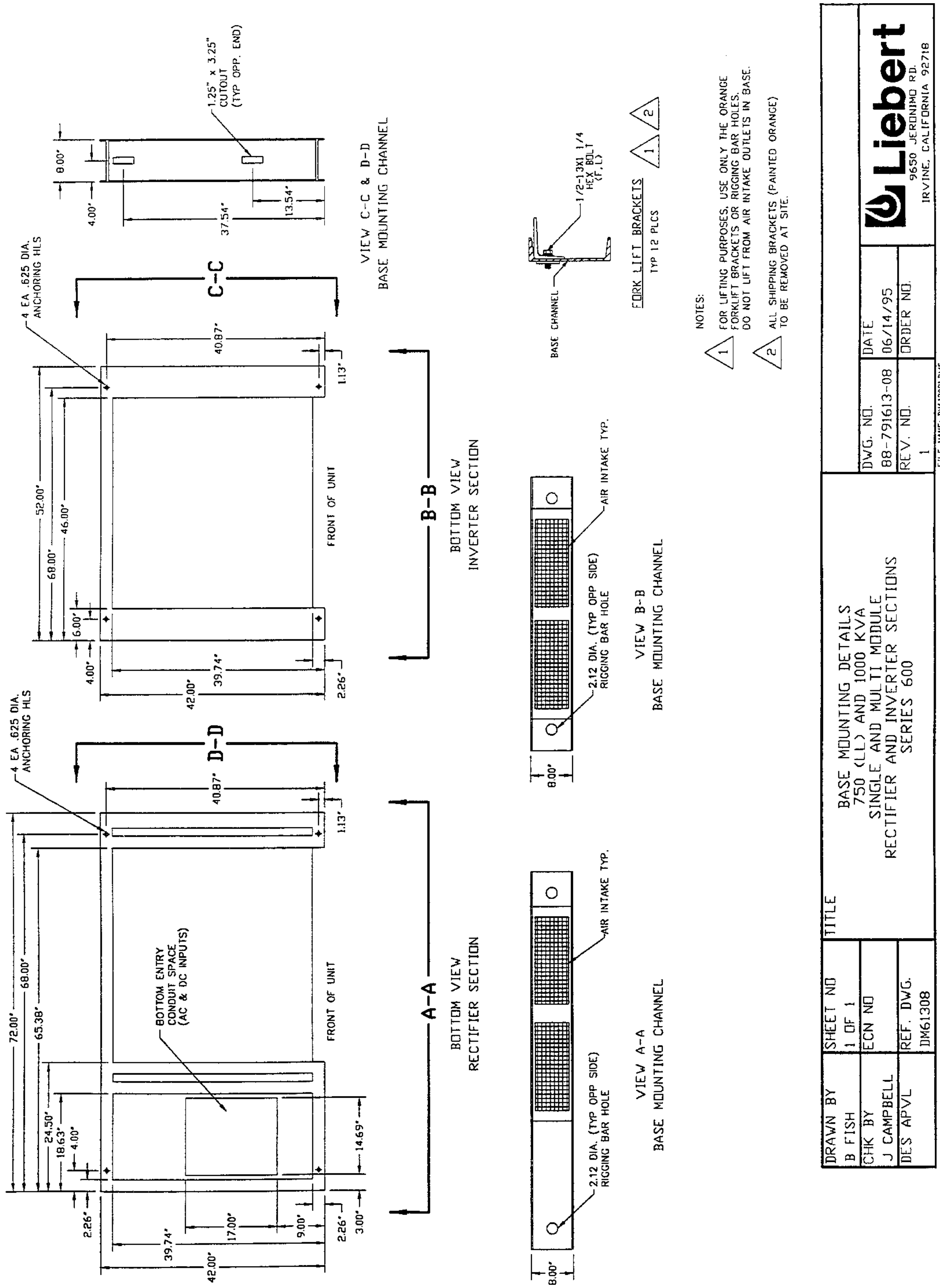


Figure 27 Base Mounting Details, 750 kVA (Low Link - 180 Cells) and 1000 kVA, Control Section

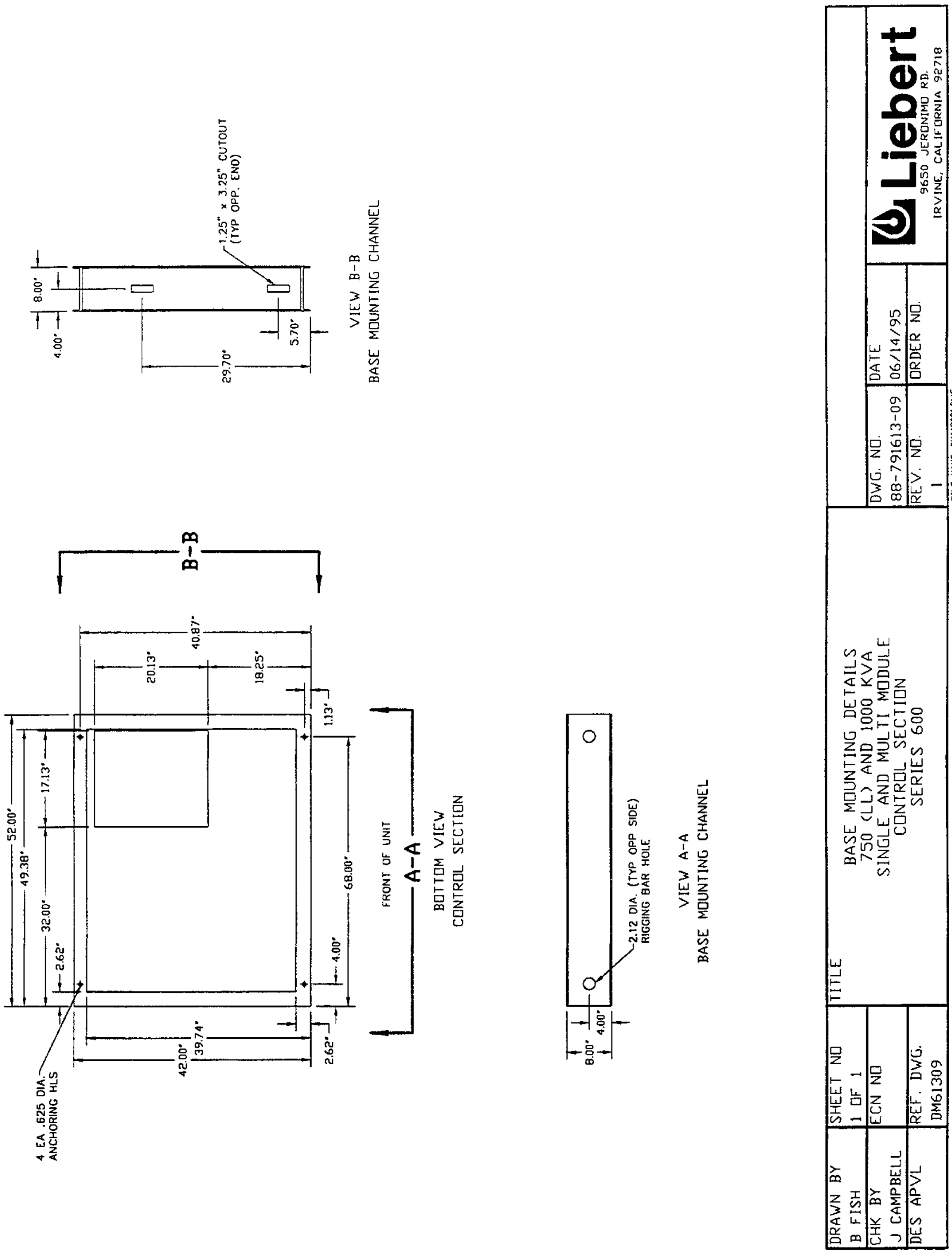


Figure 28 Base Mounting Patterns, System Control Cabinets (SCCB) 640 to 3000 Amps

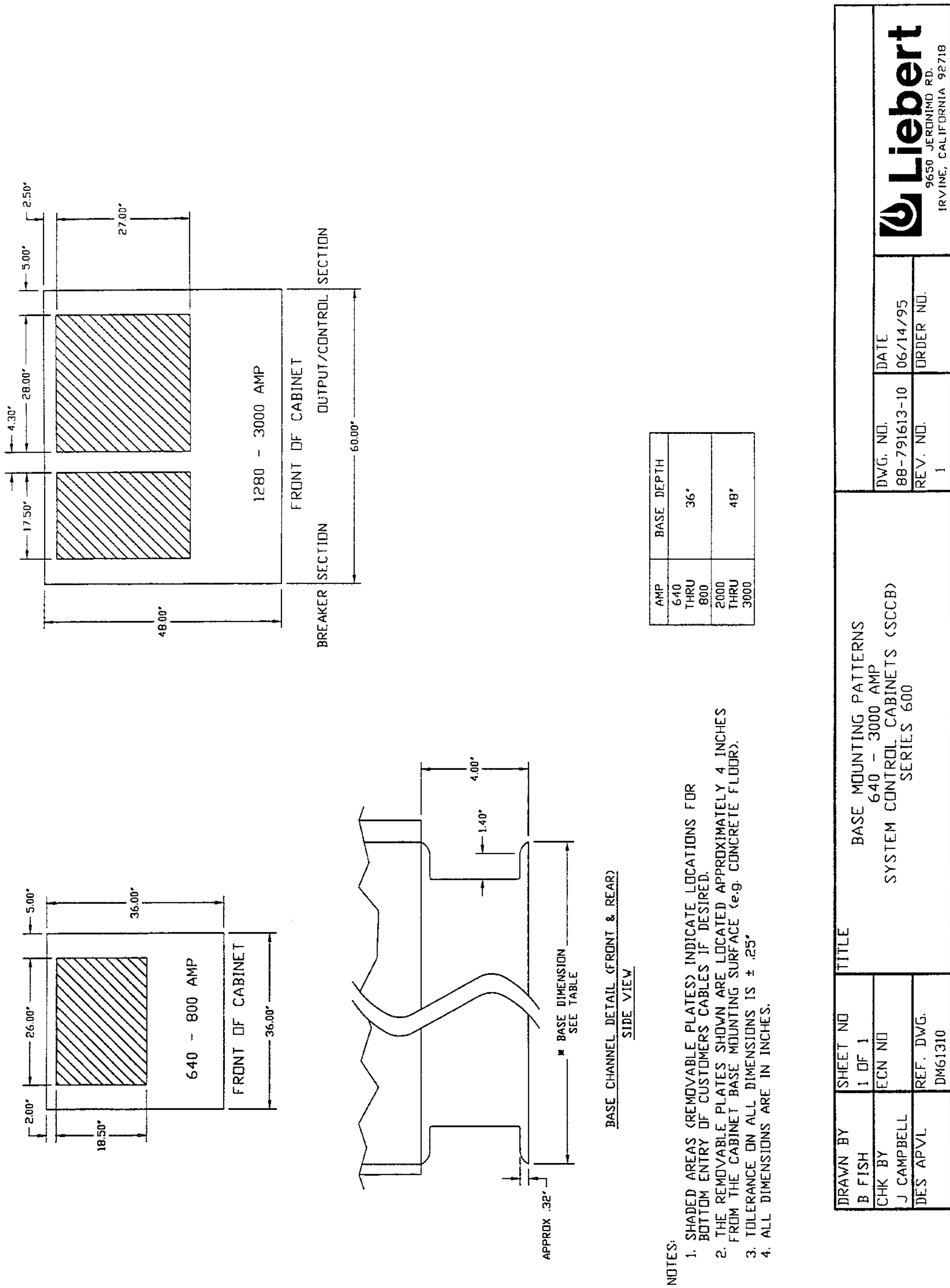


Figure 29 Base Mounting Patterns, System Control Cabinets (SCCB) 4000 Amps

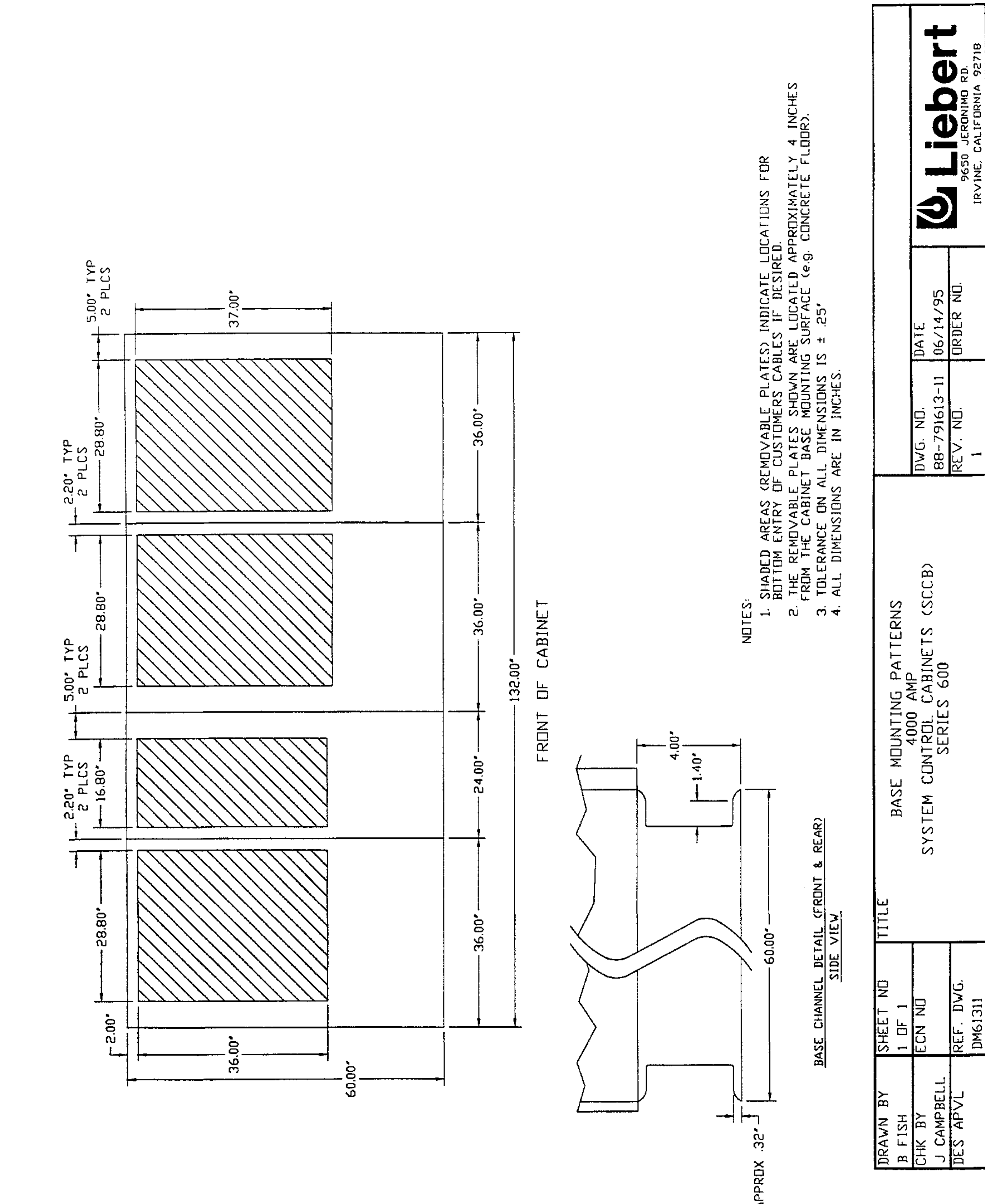


Figure 30 Base Mounting Patterns, System Control Cabinets (SCCP) 200 to 480 Amps

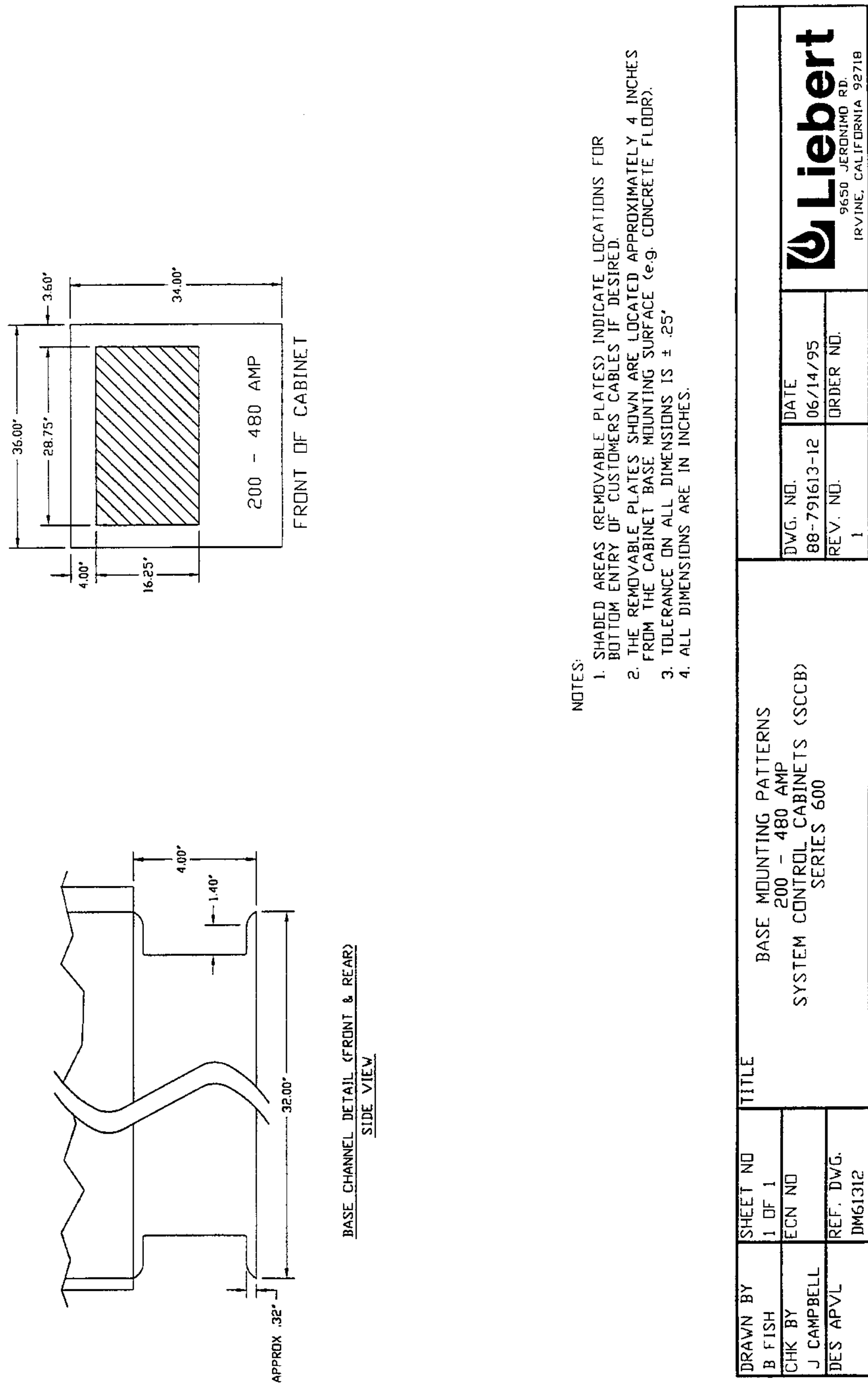


Figure 31 Base Mounting Patterns, System Control Cabinets (SCCP) 560 to 2000 Amps

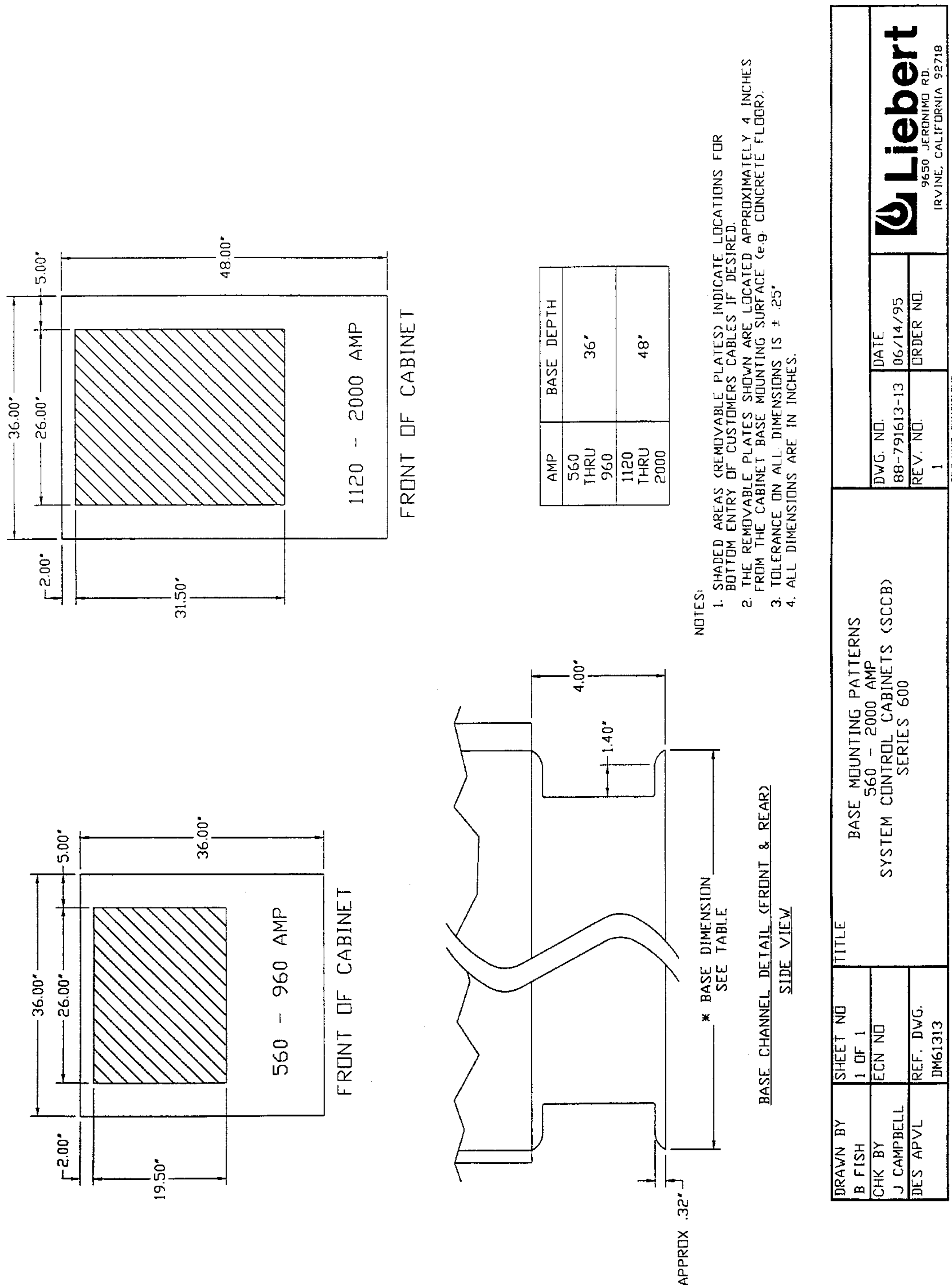


Figure 32 Base Mounting Patterns, System Control Cabinets (SCCA) 1600 to 4000 Amps

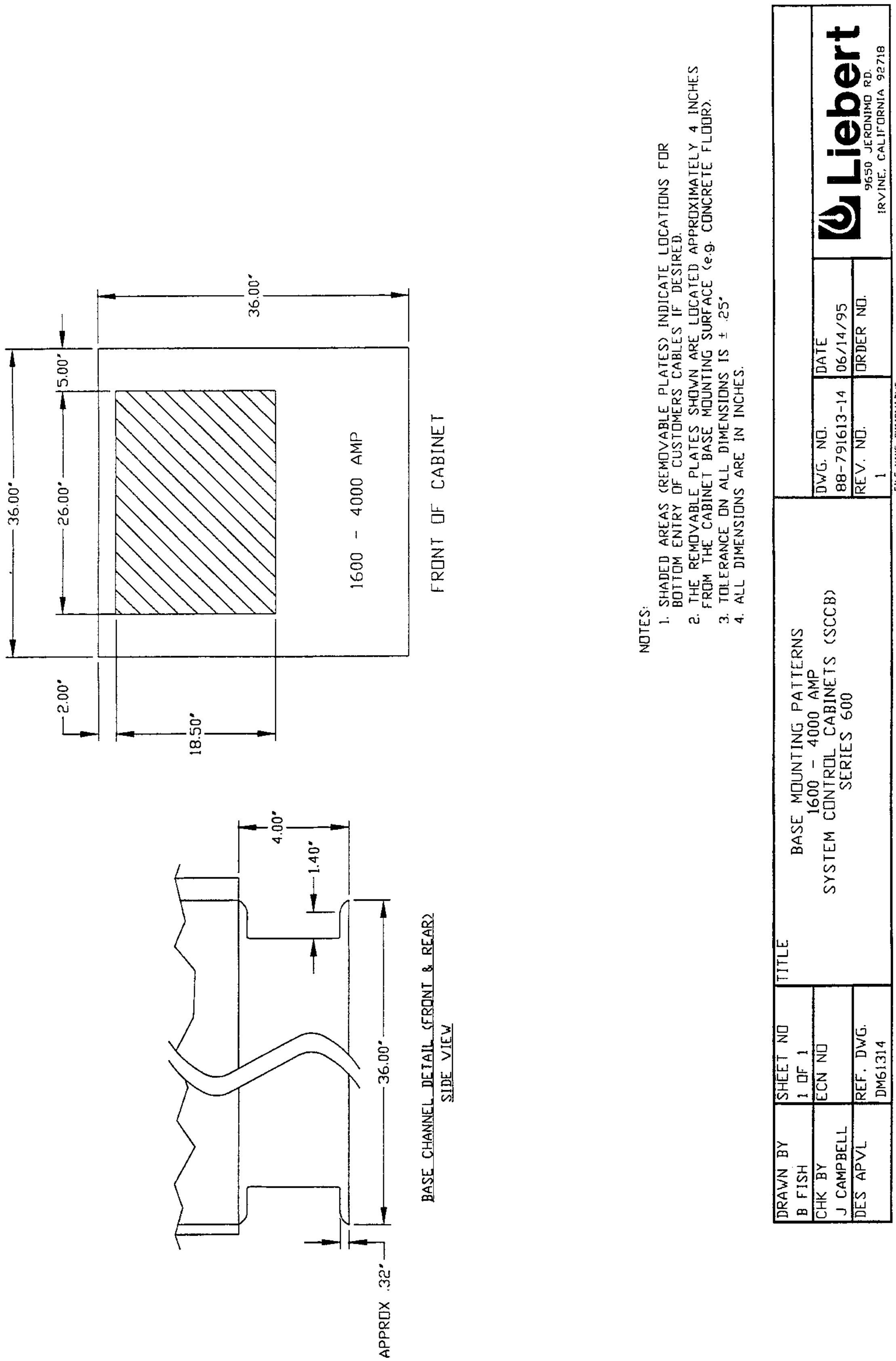


Figure 33 Shipping Split Detail, 338 kVA

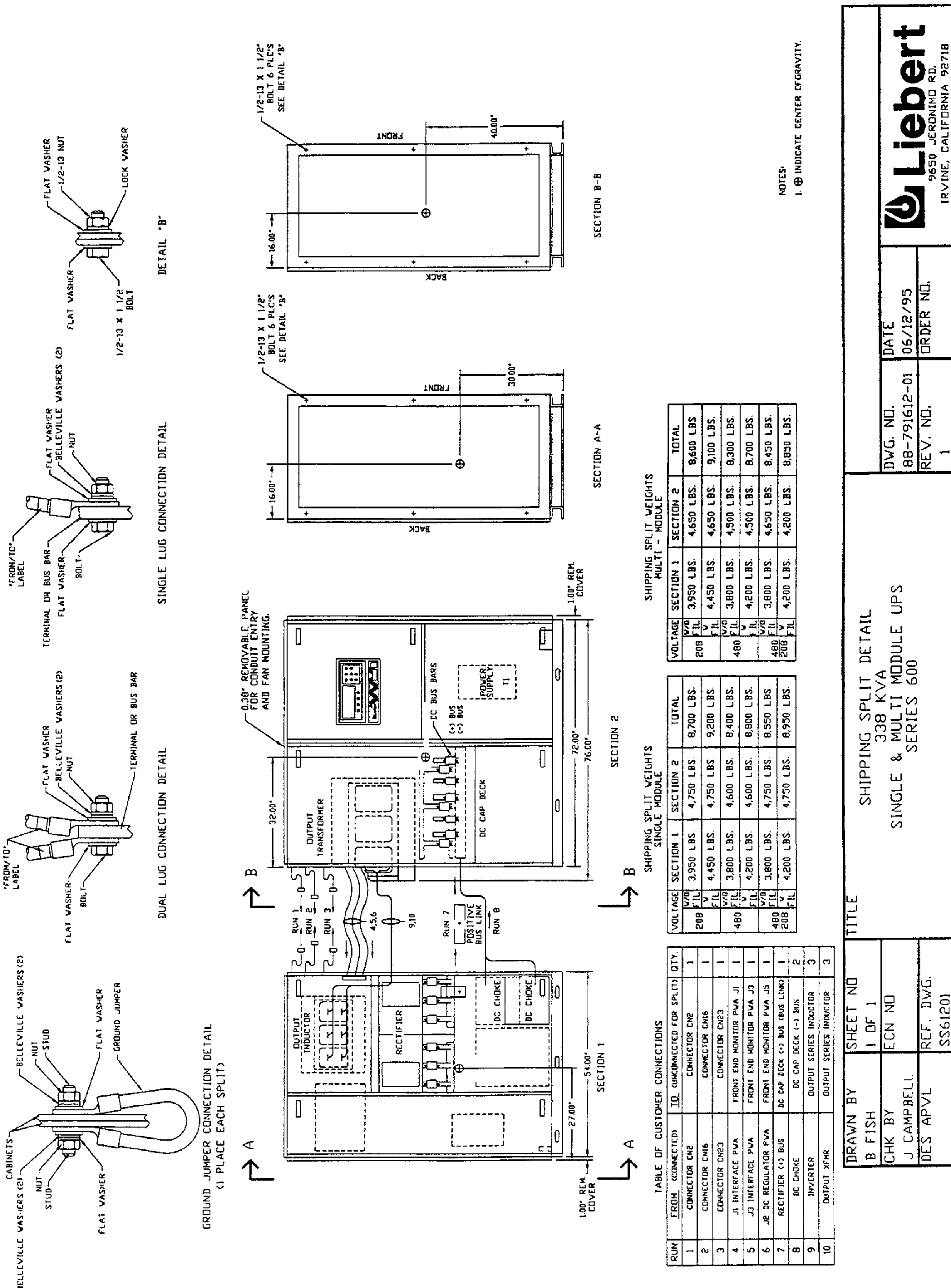


TABLE OF CUSTOMER CONNECTIONS

RUN	FROM (CONNECTED)	TO (UNCONNECTED FOR SPLIT)	QTY.
1	CONNECTOR CN2	CONNECTOR CN2	1
2	CONNECTOR CN16	CONNECTOR CN16	1
3	CONNECTOR CN23	CONNECTOR CN23	1
4	J1 INTERFACE PVA	FRONT END MONITOR PVA J1	1
5	J3 INTERFACE PVA	FRONT END MONITOR PVA J3	1
6	J2 DC REGULATOR PVA	FRONT END MONITOR PVA J5	1
7	RECTIFIER (+) BUS	DC CAP DECK (+) BUS (BUS LINK)	1
8	DC CHOKE	DC CAP DECK (-) BUS	2
9	INVERTER	OUTPUT SERIES INDUCTOR	3
10	OUTPUT XFMR	OUTPUT SERIES INDUCTOR	3

SHIPPING SPLIT WEIGHTS SINGLE MODULE

VOLTAGE		SECTION 1	SECTION 2	TOTAL
208	W/O FIL	3,950 LBS.	4,750 LBS.	8,700 LBS.
	W FIL	4,450 LBS.	4,750 LBS.	9,200 LBS.
480	W/O FIL	3,800 LBS.	4,600 LBS.	8,400 LBS.
	W FIL	4,200 LBS.	4,600 LBS.	8,800 LBS.
480/208	W/O FIL	3,800 LBS.	4,750 LBS.	8,550 LBS.
	W FIL	4,200 LBS.	4,750 LBS.	8,950 LBS.

SHIPPING SPLIT WEIGHTS MULTI - MODULE

VOLTAGE		SECTION 1	SECTION 2	TOTAL
208	W/O FIL	3,950 LBS.	4,650 LBS.	8,600 LBS
	W FIL	4,450 LBS.	4,650 LBS.	9,100 LBS.
480	W/O FIL	3,800 LBS.	4,500 LBS.	8,300 LBS.
	W FIL	4,200 LBS.	4,500 LBS.	8,700 LBS.
480/208	W/O FIL	3,800 LBS.	4,650 LBS.	8,450 LBS.
	W FIL	4,200 LBS.	4,200 LBS.	8,850 LBS.

Figure 34 Shipping Split Detail, 400 and 500 kVA

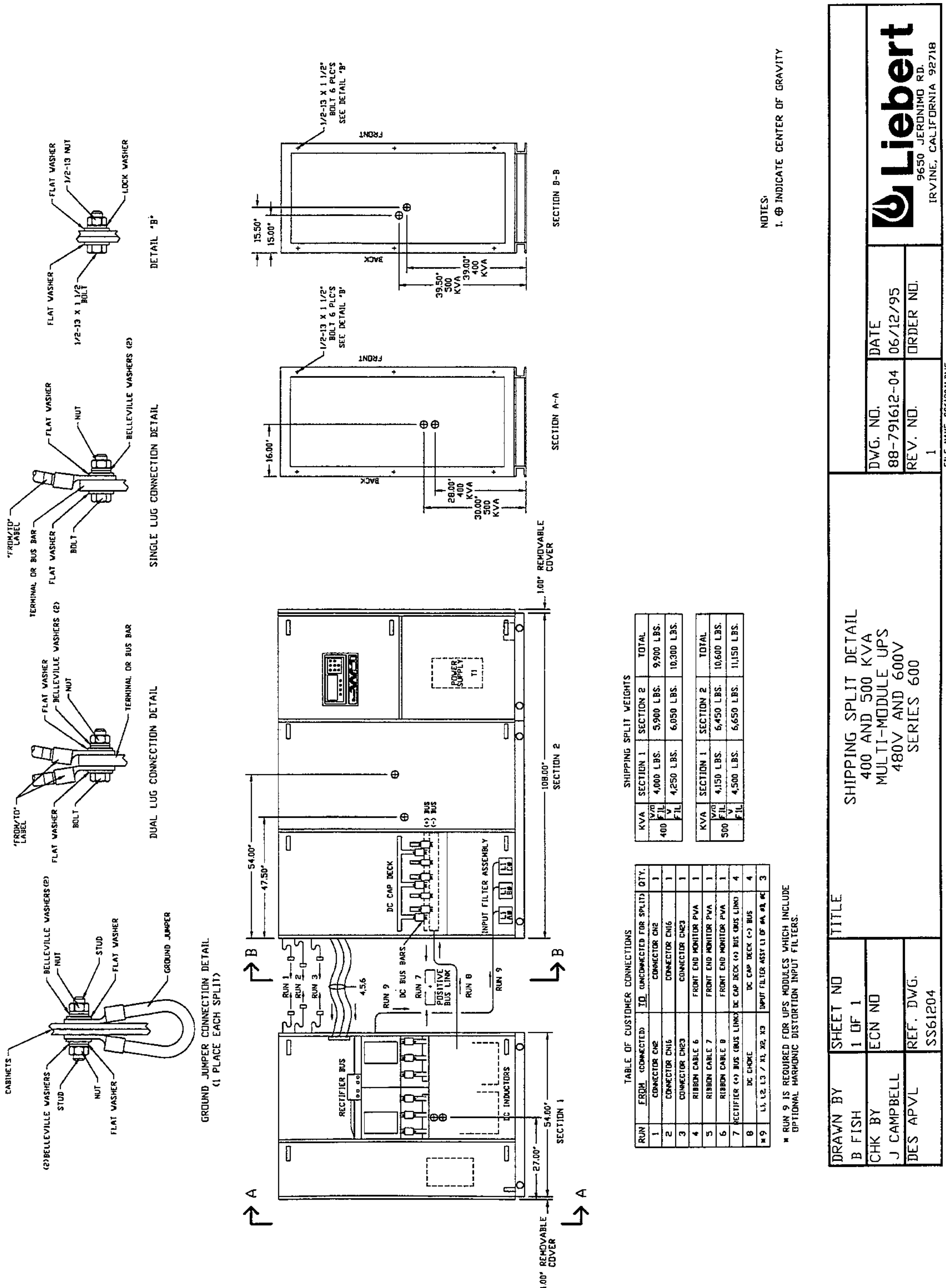


Figure 35 Shipping Split Detail, 400 and 500 kVA, 208 VAC

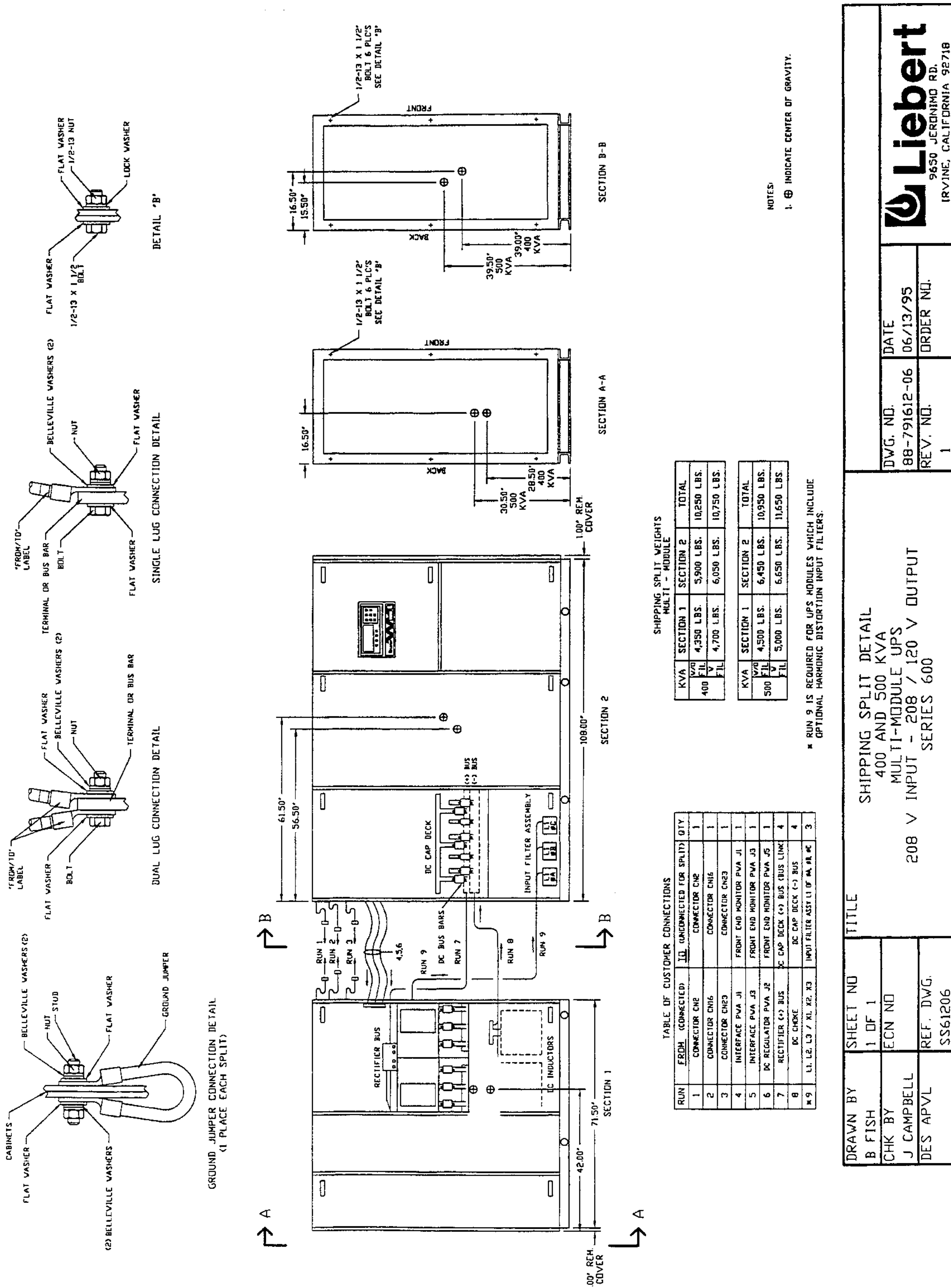


Figure 36 Shipping Split Detail, 625 kVA

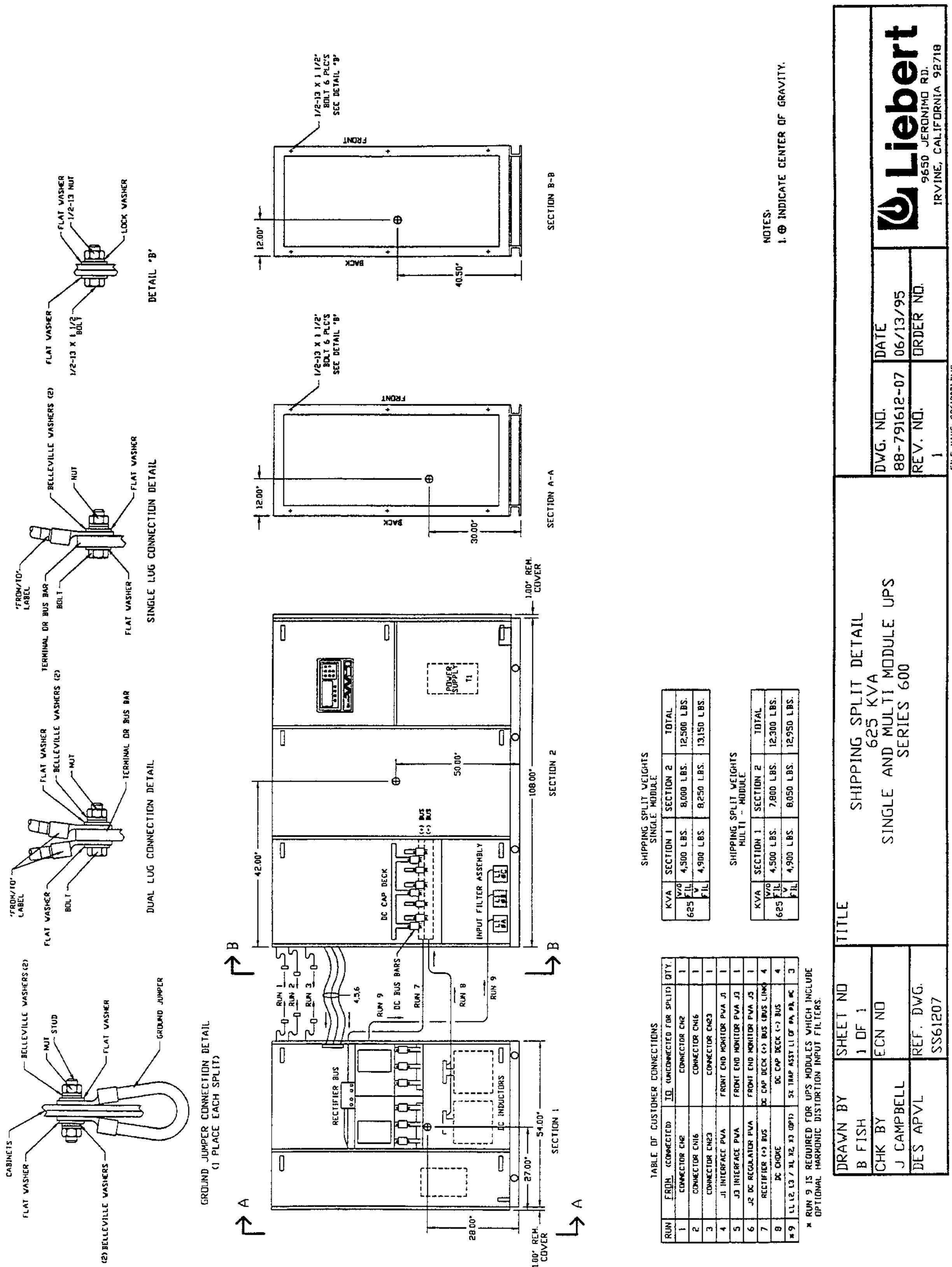


Figure 37 Shipping Split Detail, 750 kVA (High Link - 240 Cells)

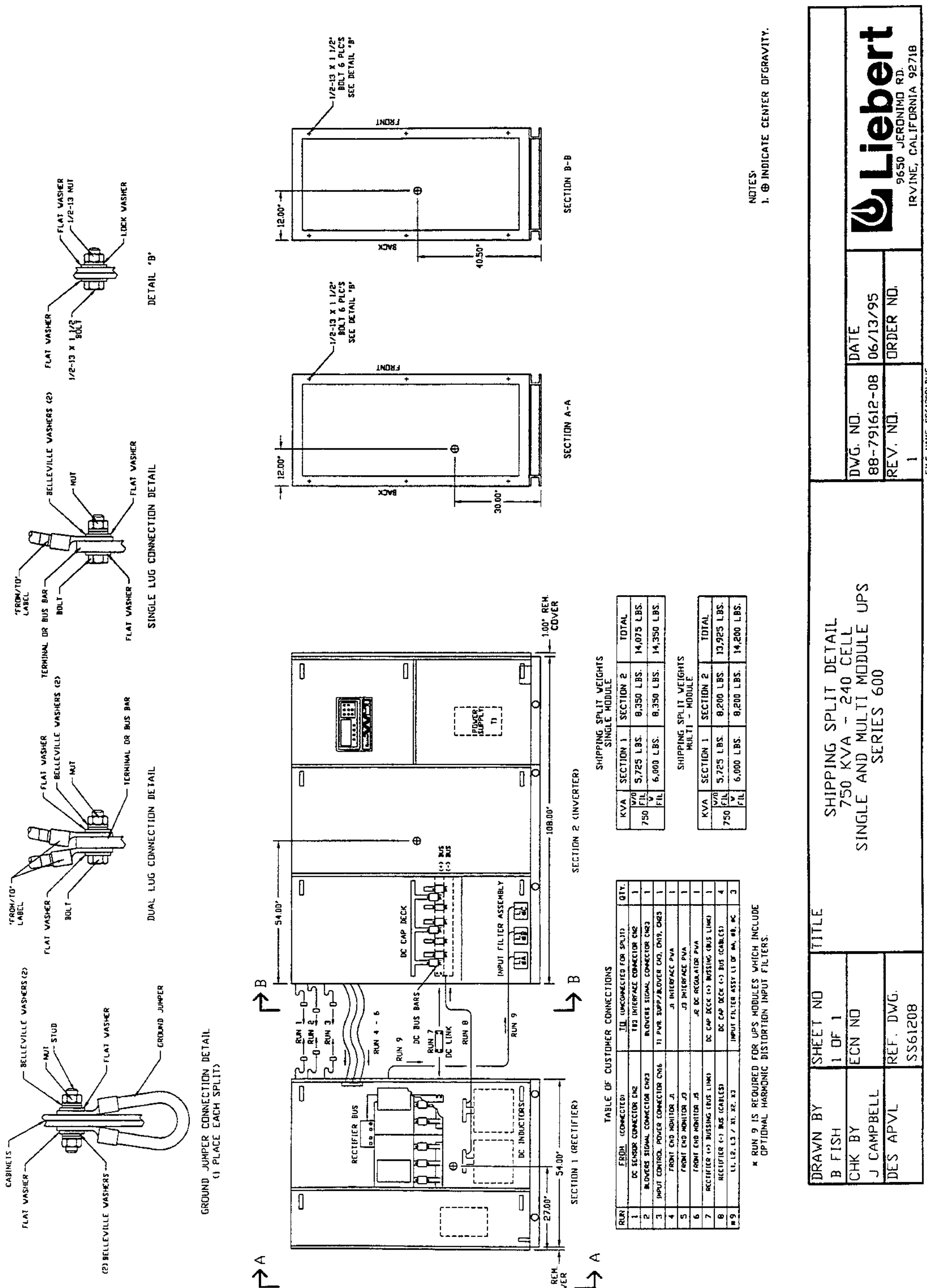


Figure 38 Shipping Split Detail, 750 kVA (Low Link - 180 Cells) and 1000 kVA

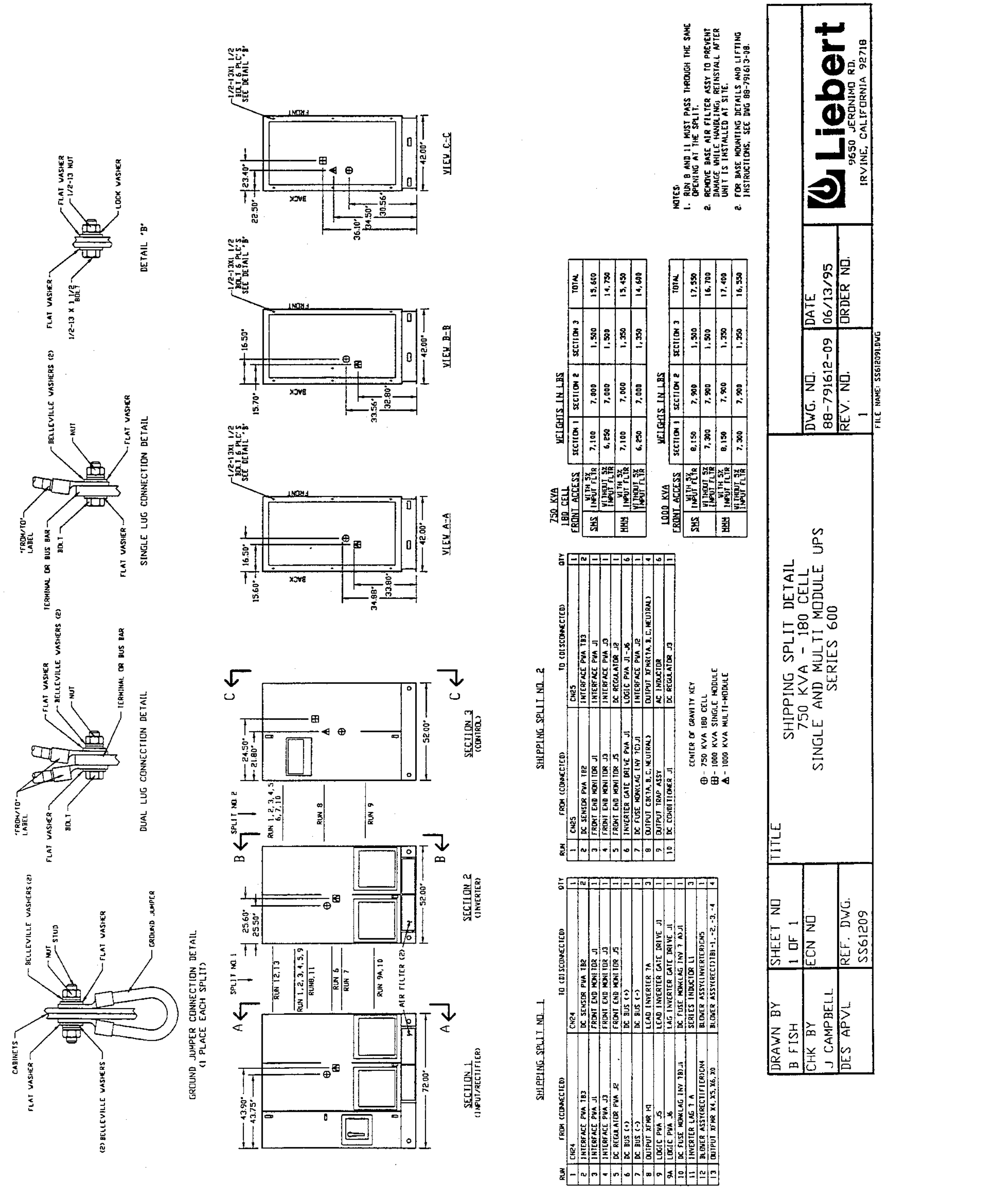


Figure 39 Optional Shipping Split Detail, 400 to 625 kVA

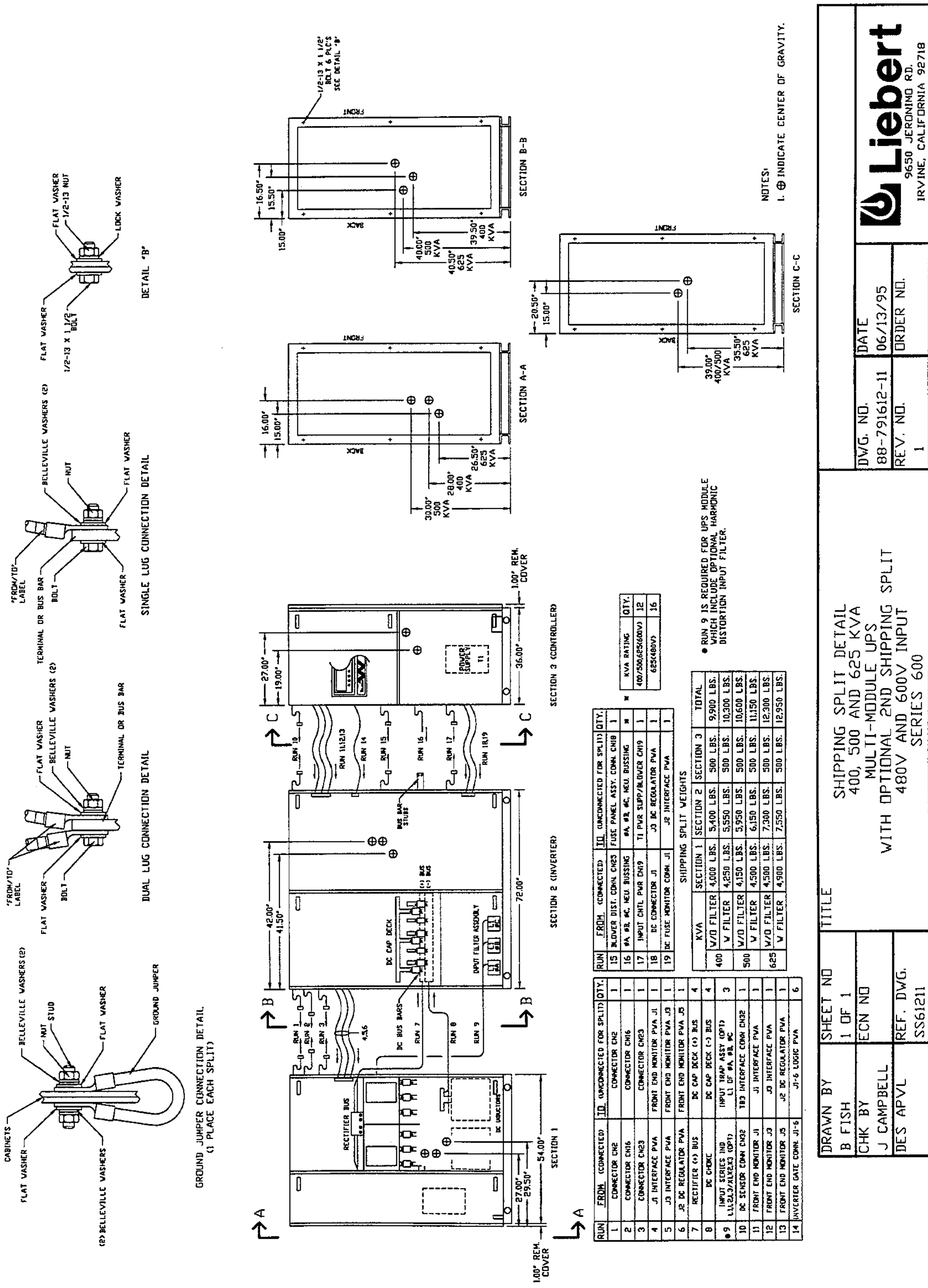


Figure 40 Optional Shipping Split Detail, 750 kVA

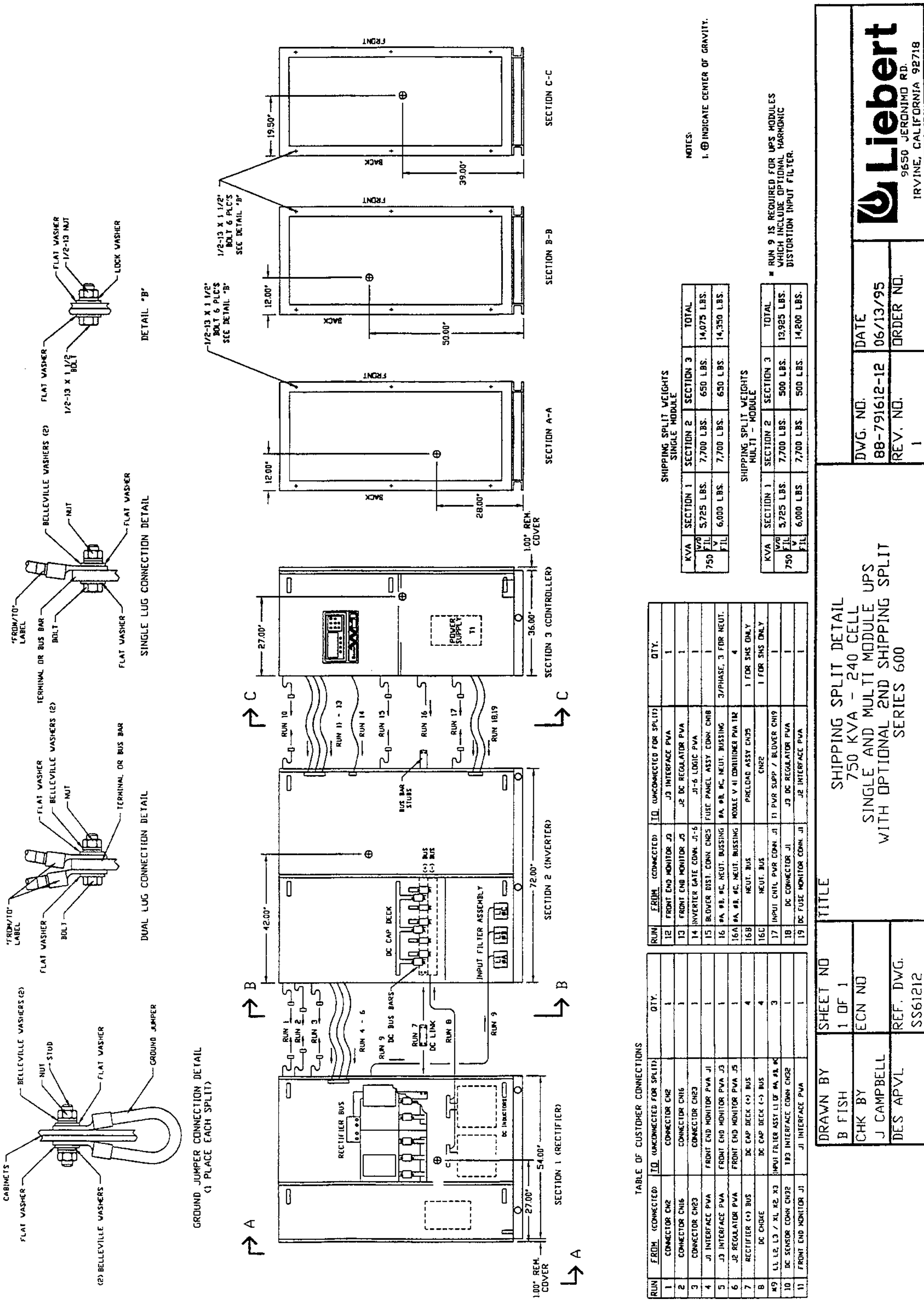


Figure 41 Optional Shipping Split Detail, System Control Cabinet (SCCA) 4000 Amps

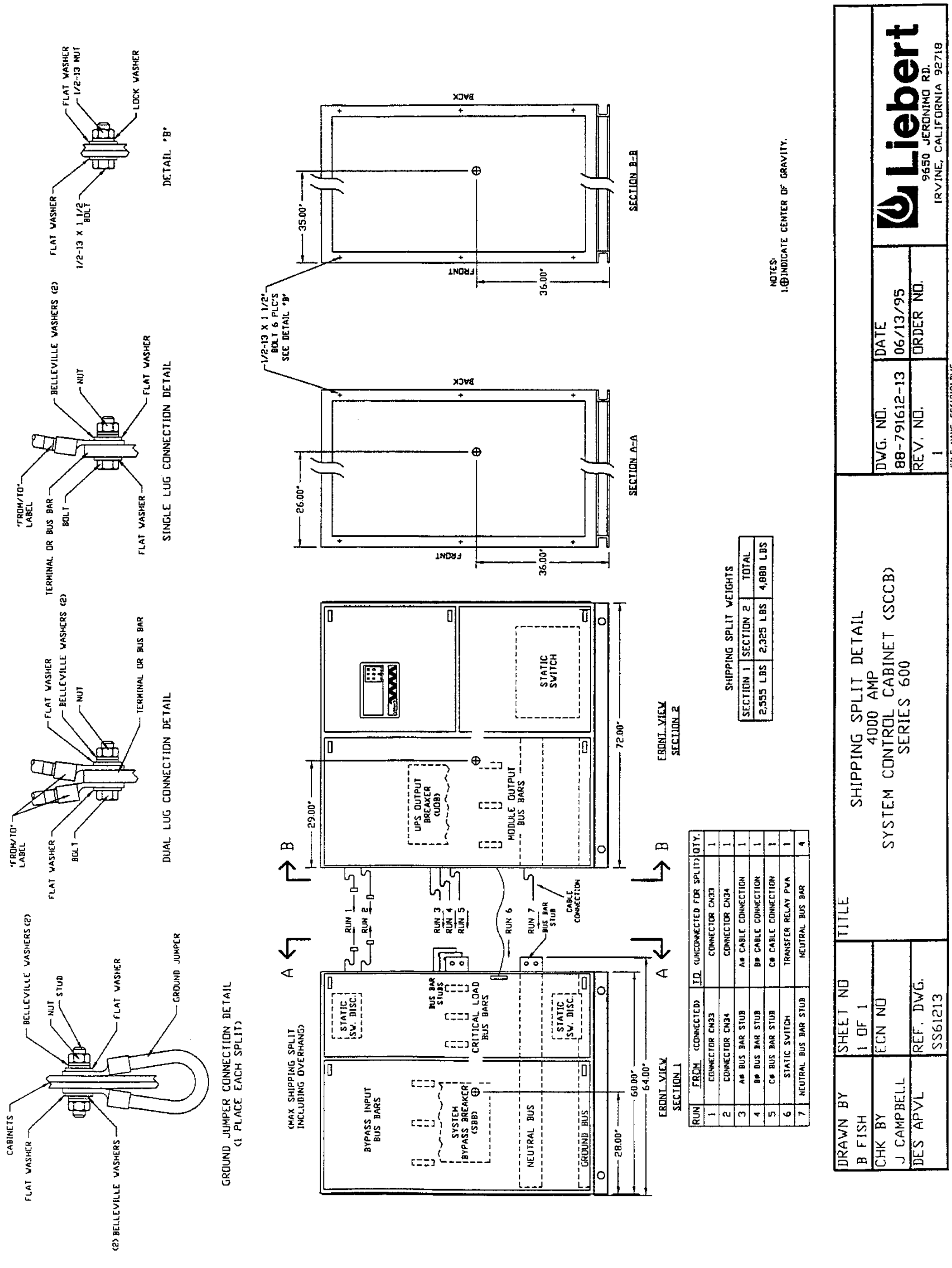


Figure 42 Bussing Details, 338 kVA

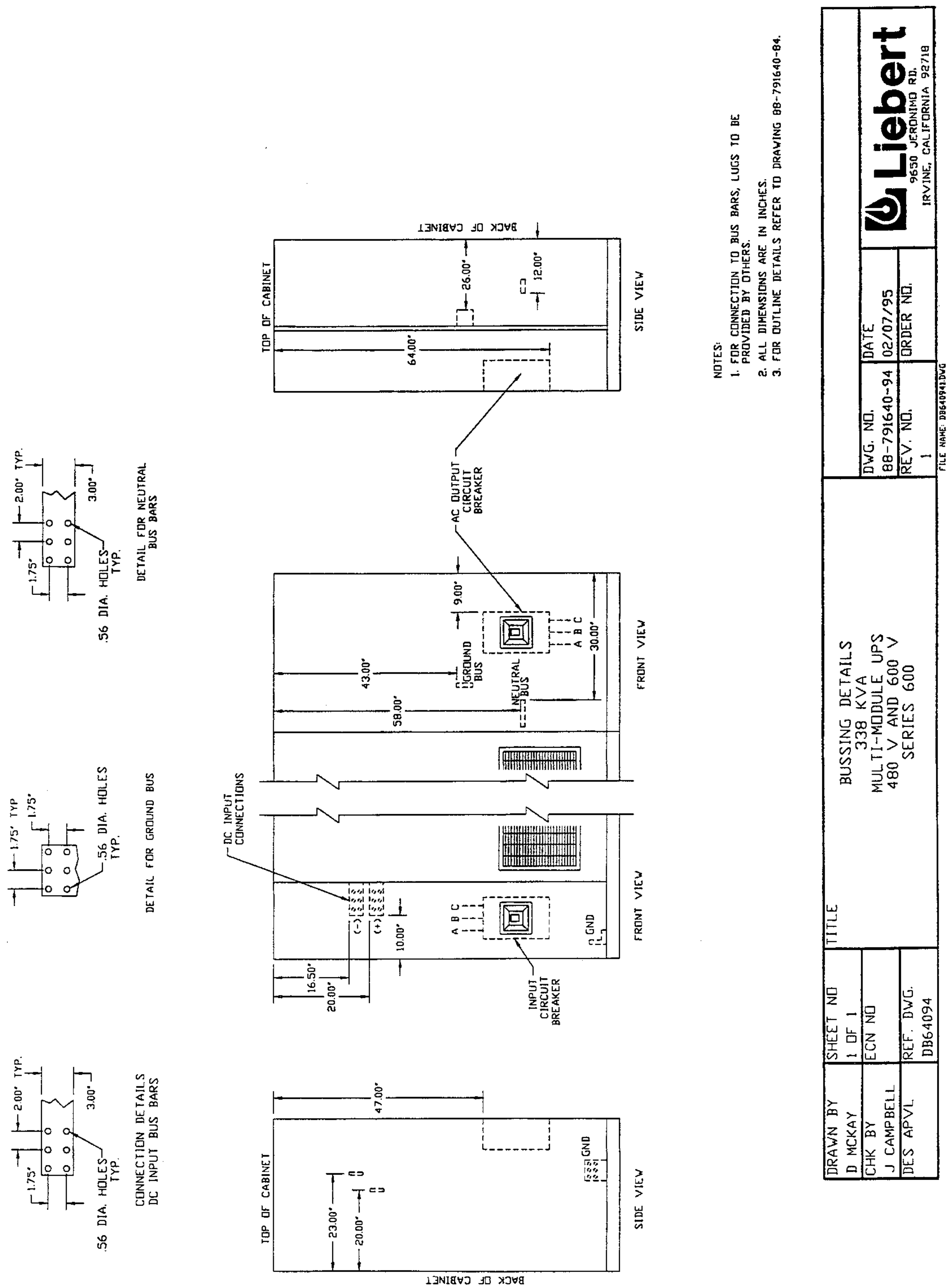


Figure 43 Bussing Details, 400 kVA

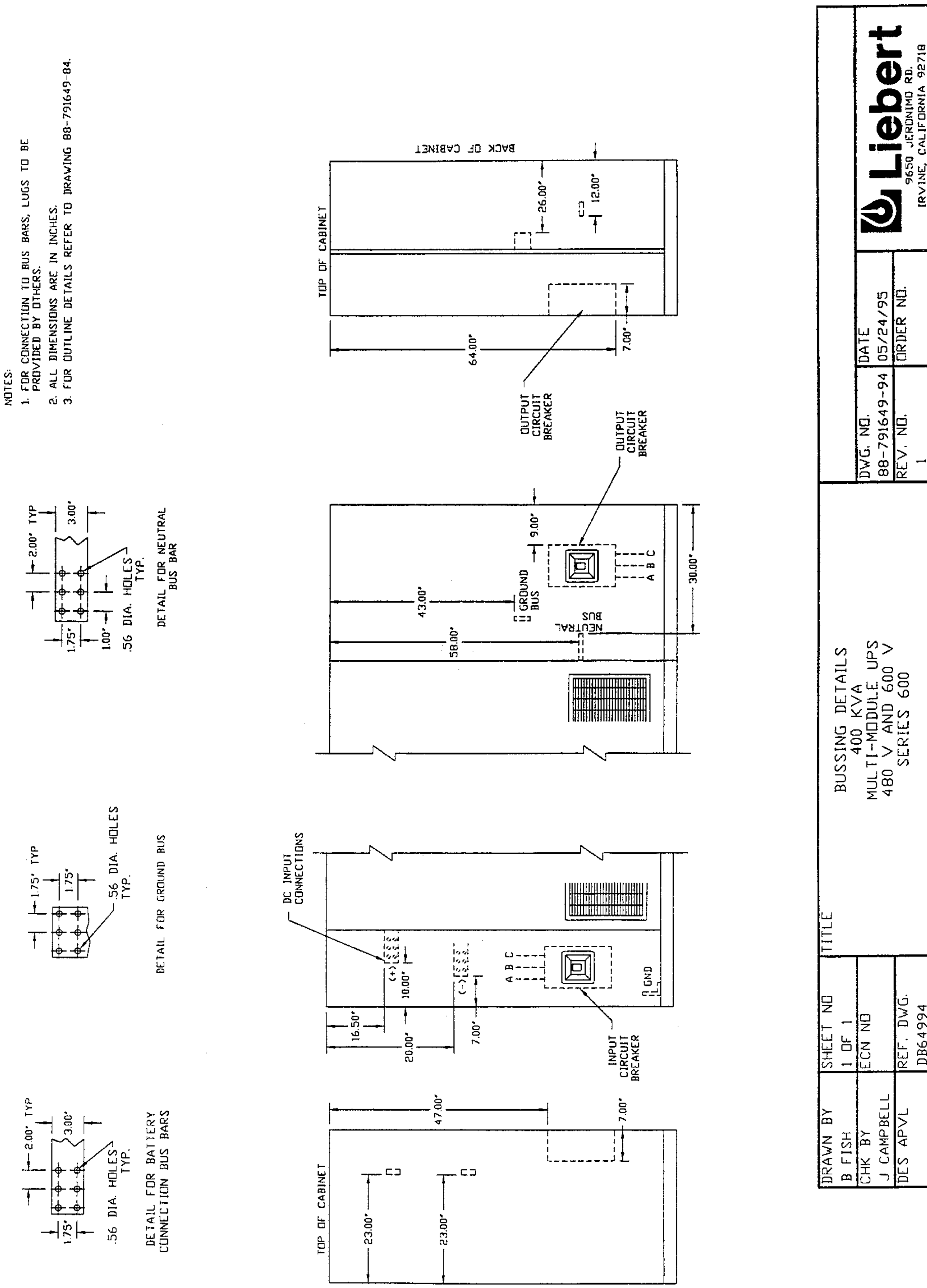


Figure 44 Bussing Details, 500 kVA

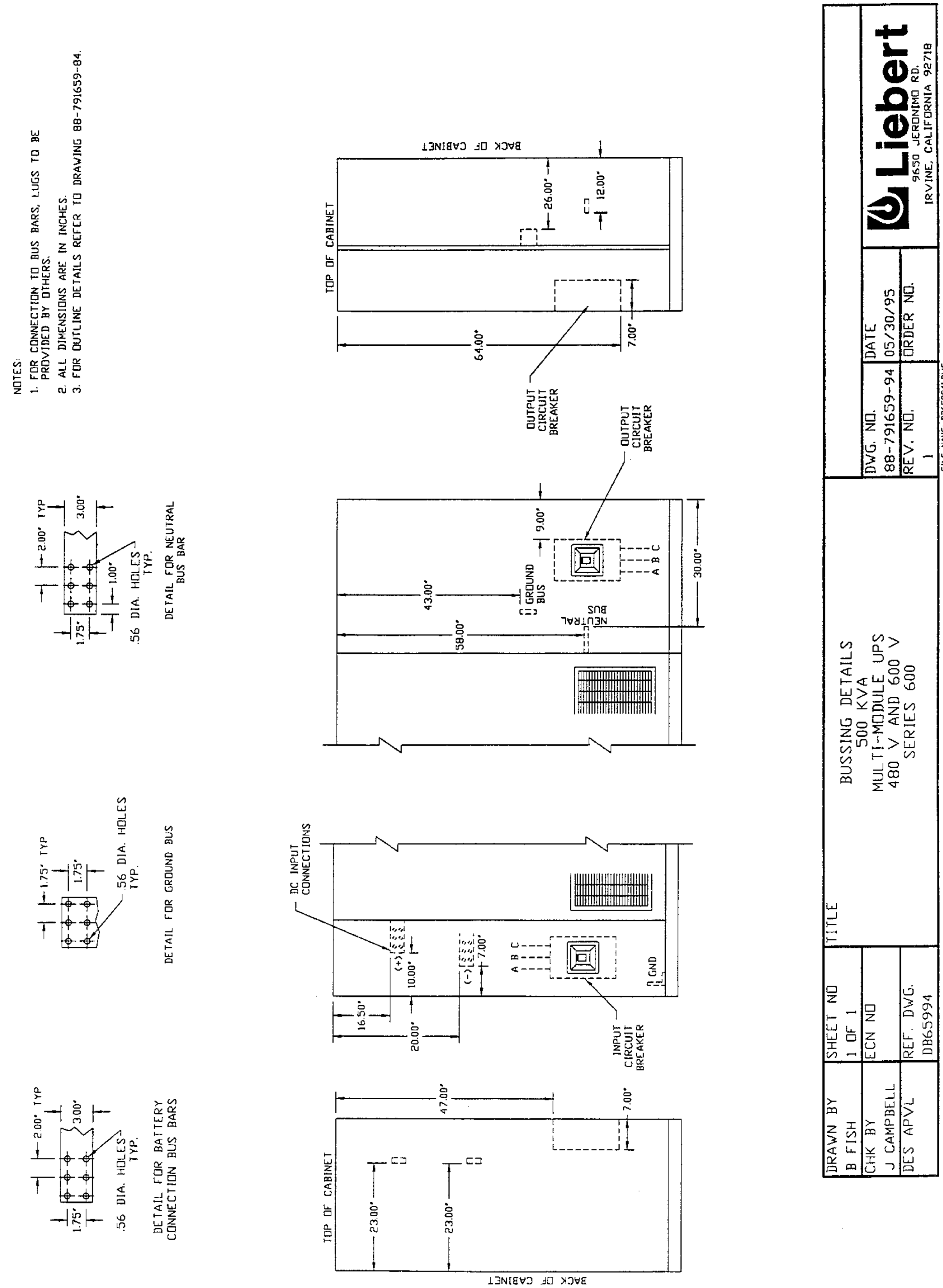


Figure 45 Bussing Details, 500 kVA, 208 VAC

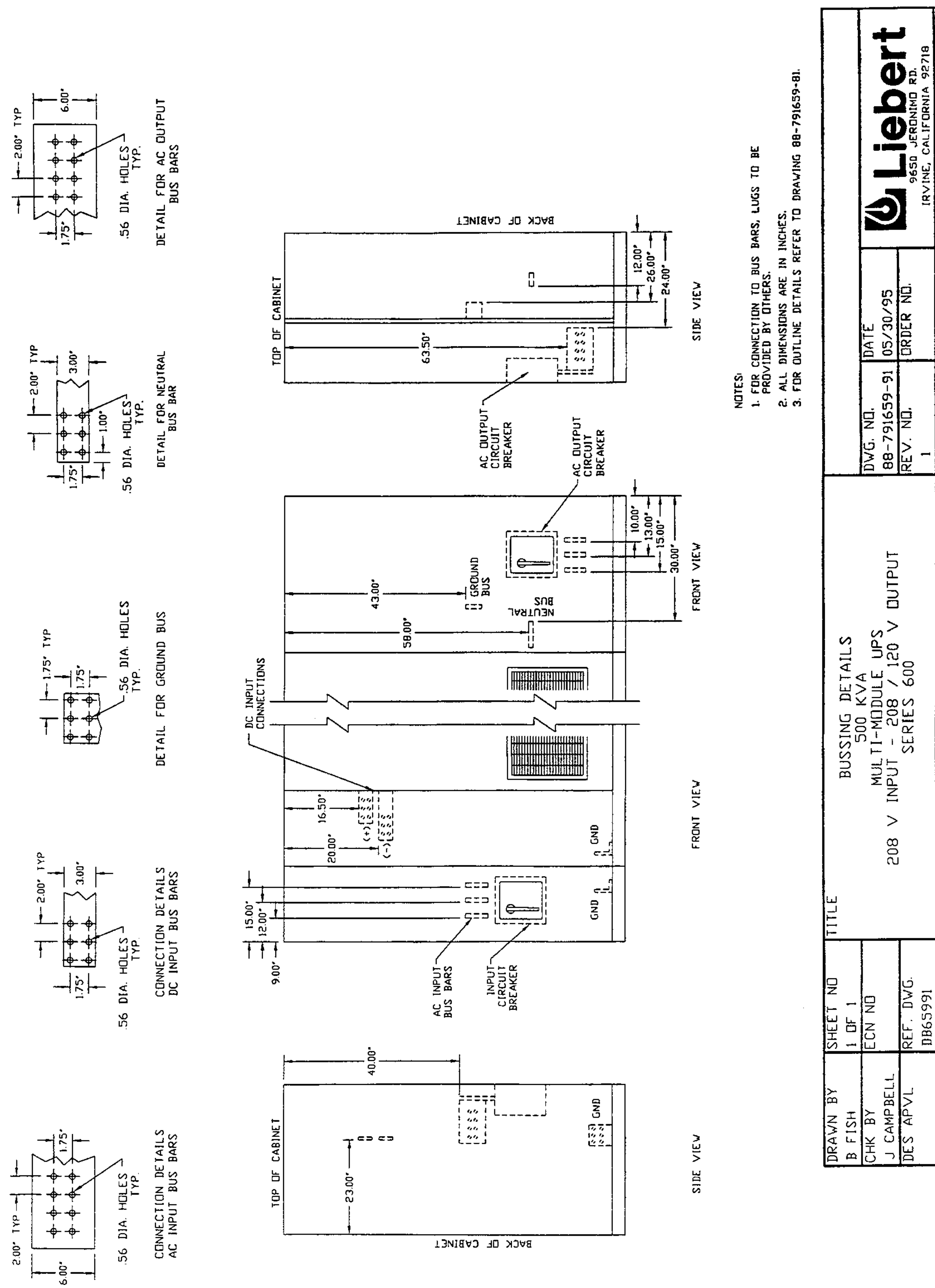


Figure 46 Bussing Details, 625 kVA

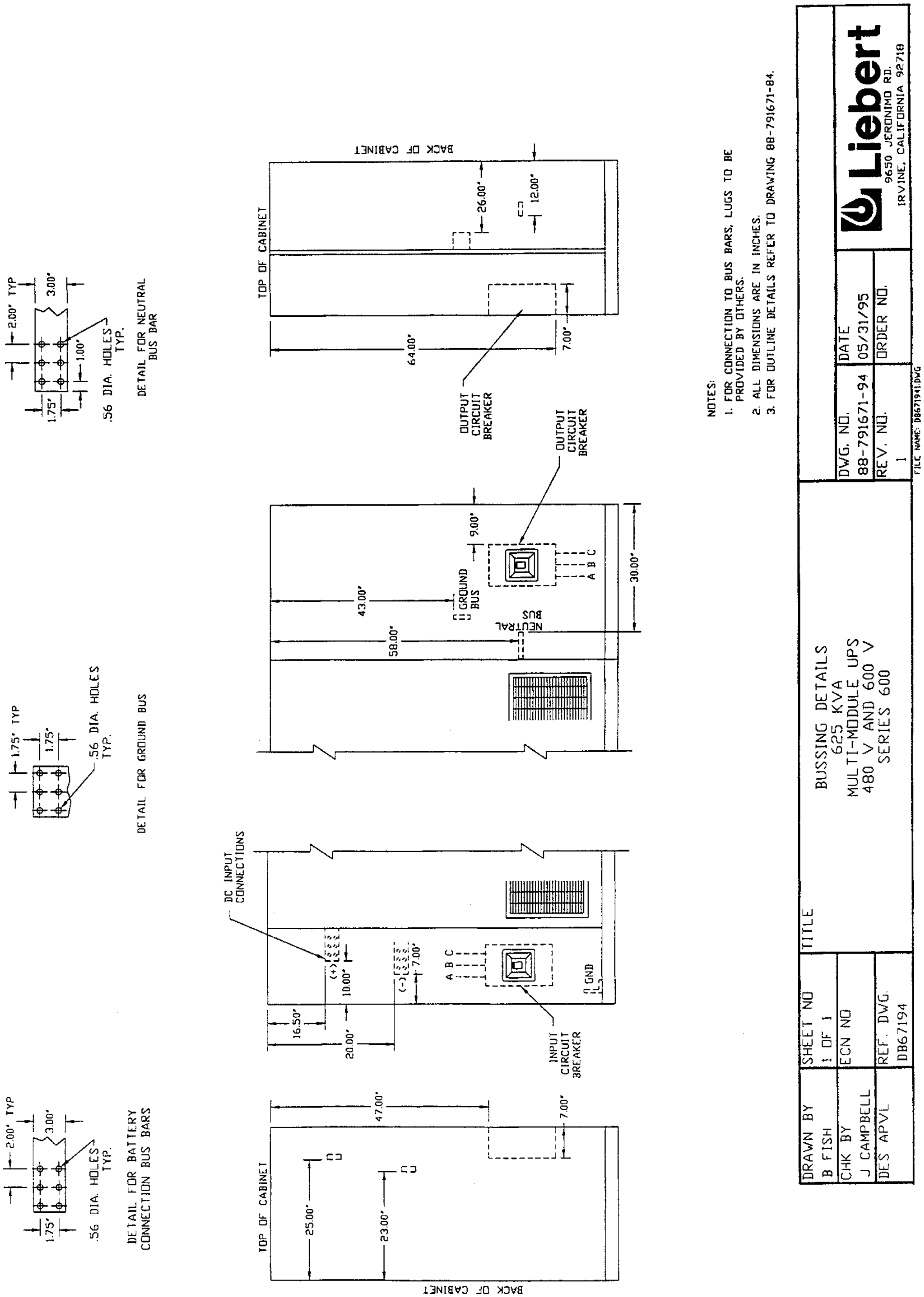


Figure 47 Bussing Details, 750 kVA (High Link - 240 Cells)

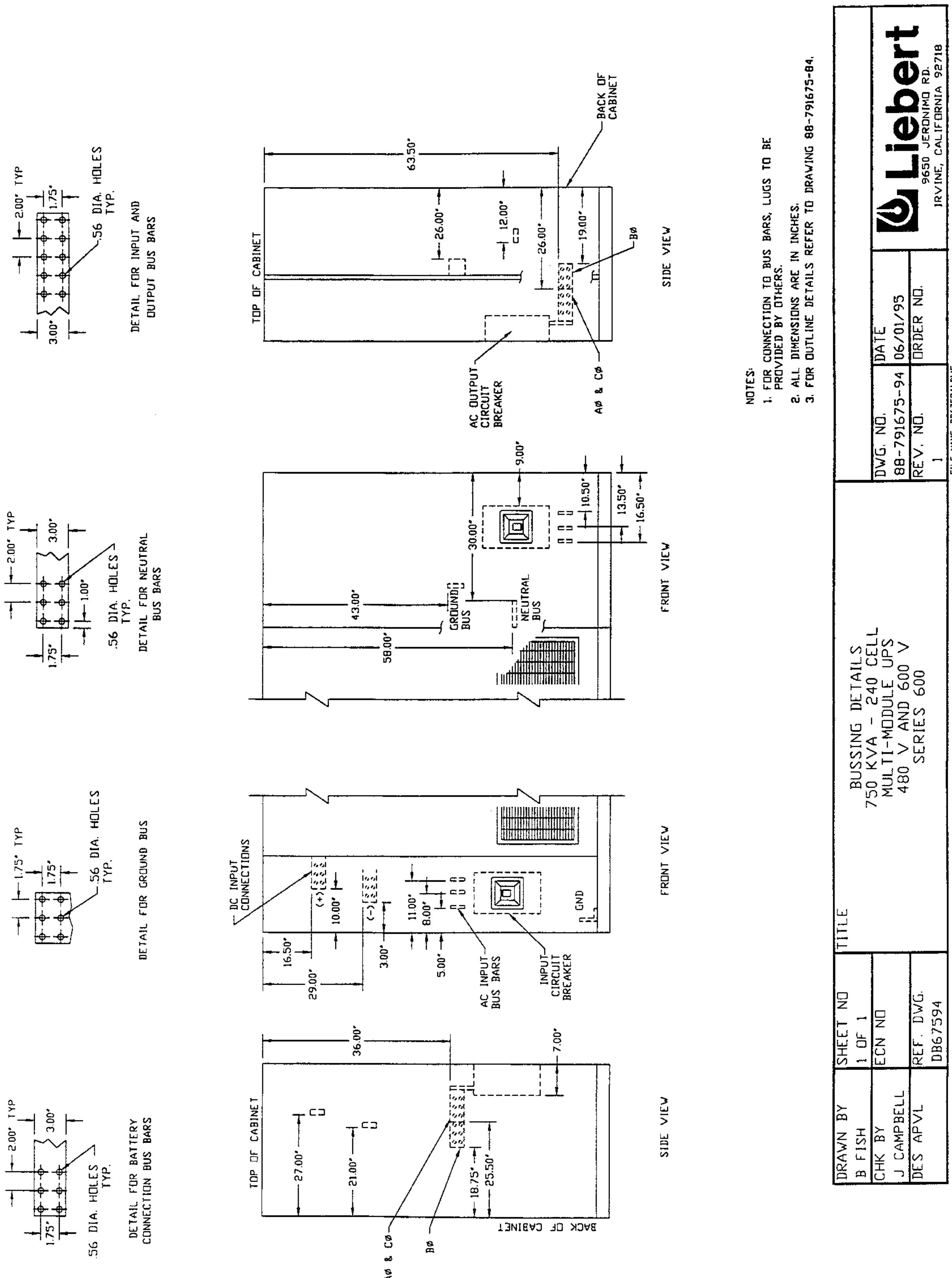


Figure 48 Bussing Details, 750 kVA (Low Link - 180 Cells)

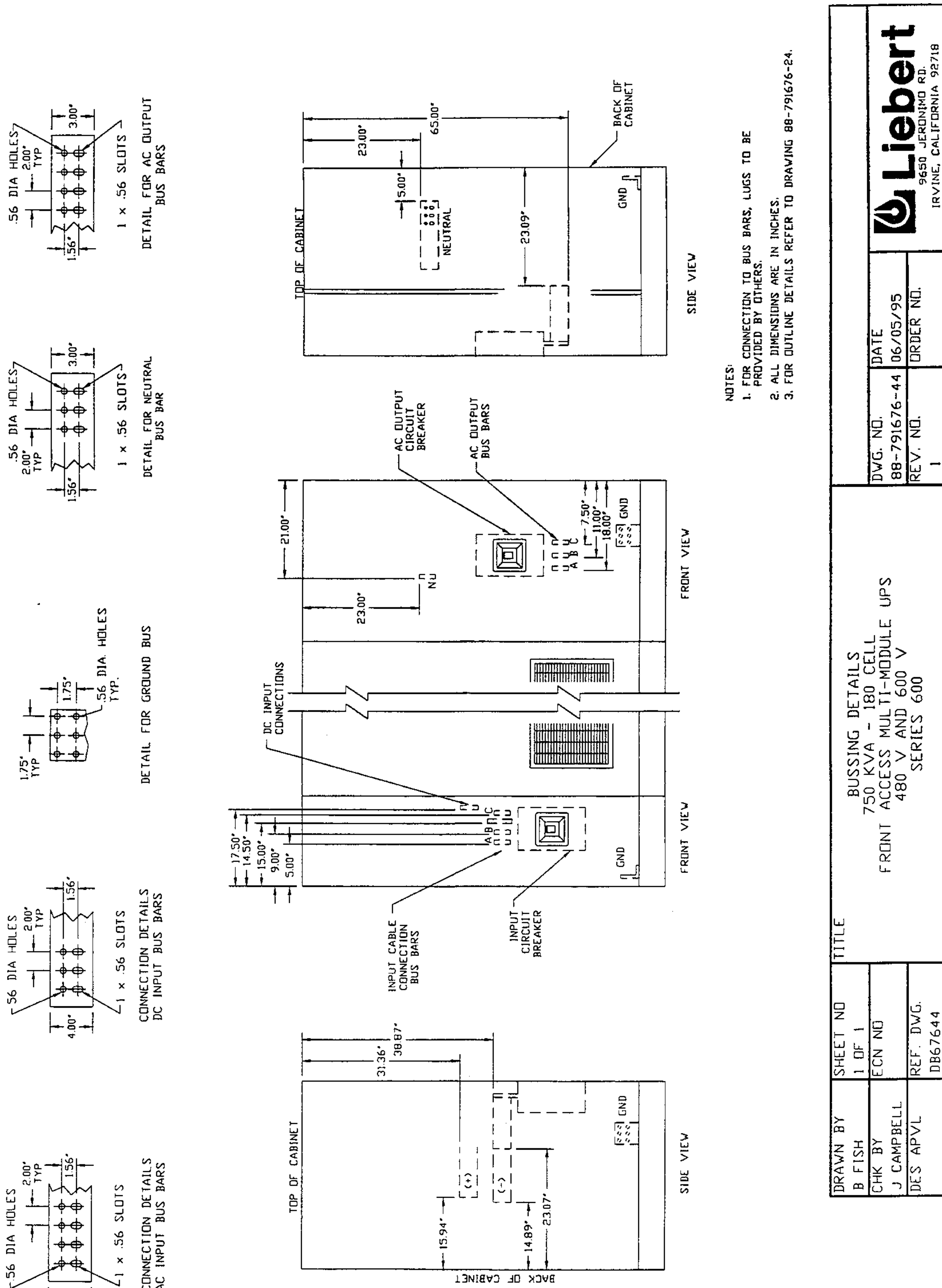


Figure 49 Bussing Details, 1000 kVA

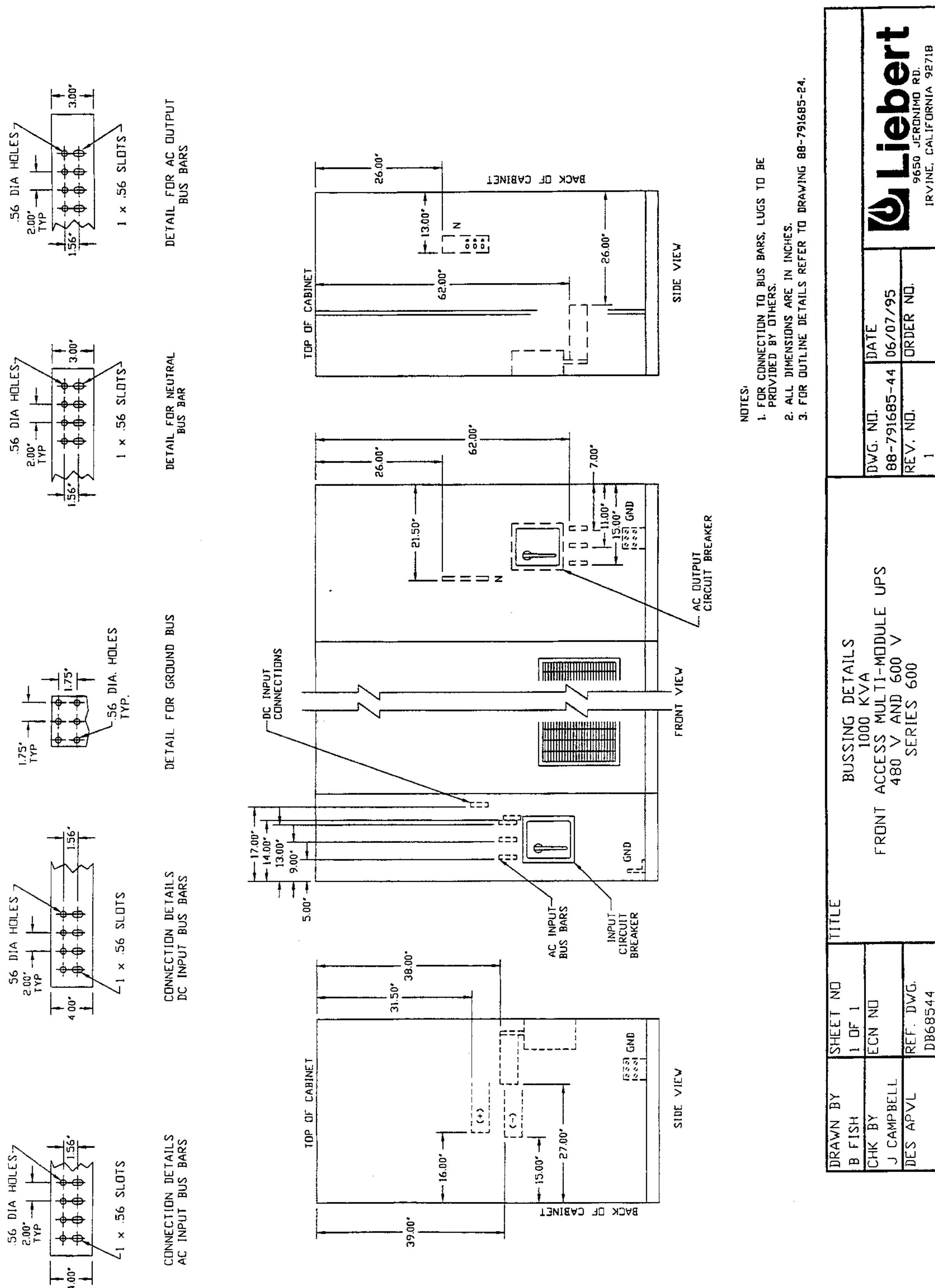
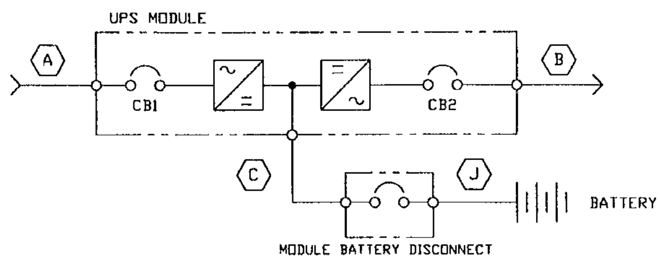


Figure 50 Module One-Line Diagram, 338 kVA



NOTES:

1. NOMINAL CURRENT IS BASED ON FULL RATED OUTPUT LOAD.
2. MAXIMUM CURRENT IS COMBINATION OF SHORT DURATION LOAD CURRENT (NONCONTINUOUS LOAD) FOR BATTERY RECHARGE PLUS NOMINAL FULL LOAD CURRENT (CONTINUOUS LOAD) PER NEC 100
3. MAXIMUM CURRENT IS COMBINATION OF SHORT DURATION LOAD CURRENT (NONCONTINUOUS LOAD) FOR 10 MINUTE OVERLOAD RATING PLUS NOMINAL FULL LOAD CURRENT (CONTINUOUS LOAD) PER NEC 100.
4. UPS OUTPUT LOAD CABLES MUST BE RUN IN SEPARATE CONDUIT FROM INPUT CABLES.
5. POWER CABLES FROM DC LINK TO BATTERIES SHOULD BE SIZED FOR TOTAL MAXIMUM 2.0 VOLT LINE DROP AT MAXIMUM DISCHARGE CURRENT. MAXIMUM CURRENT AT END OF BATTERY DISCHARGE (300 VDC) IS DEFINED AS NONCONTINUOUS PER NEC 100.
6. GROUNDING CONDUCTORS TO BE SIZED PER NEC 250-95. NEUTRAL CONDUCTOR (IF USED) SHOULD BE SIZED FOR FULL CAPACITY.
7. ALL WIRING IS TO BE IN ACCORDANCE WITH NATIONAL AND LOCAL ELECTRICAL CODES.
8. MODULE BATTERY DISCONNECT IS PROVIDED IN A SEPARATE ENCLOSURE.
9. POWER AND CONTROL WIRING TO BE RUN IN SEPARATE CONDUITS.
10. WHEN A THREE POLE MODULE BATTERY DISCONNECT IS USED, ONE POLE MAY BE USED TO CENTER TAP THE BATTERY STRING. THIS WILL REDUCE THE MAXIMUM VOLTAGE BETWEEN ANY TWO POINTS TO ONE HALF THE STRING VOLTAGE WHEN THE MODULE BATTERY DISCONNECT IS OPEN.
11. BREAKER DESCRIPTIONS
    CB1 - SQUARE D TYPE MHL36600, 1000 AF, 600 AT, 65 KAIC.
    CB2 - SQUARE D TYPE MHL36600, 1000 AF, 600 AT, 65 KAIC.
12. NOMINAL HEAT GENERATION - 80,131 BTU/HR.

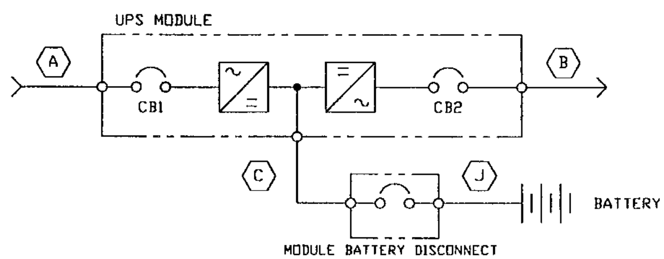
	FEEDER	NOMINAL VOLTAGE	NOMINAL CURRENT	MAXIMUM CURRENT
A	AC INPUT TO UPS 3 PHASE, 3 WIRE & GROUND. A-B-C ROTATION (SEE NOTES 1,2,4,6,7)	480 VAC	420 A 380 A	525 A (W/O FILTER) 474 A (WITH FILTER)
B	AC OUTPUT TO LOAD, 3 PH., 4 WIRE & GROUND. A-B-C PHASE ROTATION (SEE NOTES 1,3,4,6,7) MAXIMUM 10 MIN. @ 125% OF NOMINAL CURRENT.	480Y/277 VAC	406 A	507 A
C	UPS DC LINK TO MODULE BATTERY DISCONNECT. (1) POSITIVE, AND (1) NEGATIVE. (SEE NOTES 5,7,8)	360 VDC	800 A	993 A AT END OF DISCHARGE
J	MODULE BATTERY DISCONNECT TO SYSTEM BATTERY. (1) POSITIVE, AND (1) NEGATIVE AND (1) POSITIVE, AND (1) NEGATIVE FOR CENTER TAP (SEE NOTES 5,7,8,10)	360 VDC	800 A	993 A AT END OF DISCHARGE

DRAWN BY D MCKAY	SHEET NO 1 OF 1	TITLE ONE - LINE DIAGRAM 338 KVA / 270 KW PARALLEL MODULE UPS 480 V INPUT - 480 / 277 V OUTPUT SERIES 600	DWG. NO. 97-791640-84	DATE 02/08/95
CHK BY J CAMPBELL	ECN NO		REV. NO. 1	ORDER NO.
DES APVL	REF. DWG. SL64084			

Liebert
9650 JERONIMO RD.
IRVINE, CALIFORNIA 92718

FILE NAME: SL64084I.DWG

Figure 51 Module One-Line Diagram, 400 kVA



NOTES:

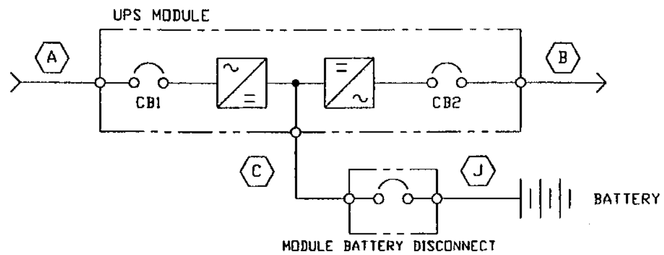
1. NOMINAL CURRENT IS BASED ON FULL RATED OUTPUT LOAD.
2. MAXIMUM CURRENT IS COMBINATION OF SHORT DURATION LOAD CURRENT (NONCONTINUOUS LOAD) FOR BATTERY RECHARGE PLUS NOMINAL FULL LOAD CURRENT (CONTINUOUS LOAD) PER NEC 100
3. MAXIMUM CURRENT IS COMBINATION OF SHORT DURATION LOAD CURRENT (NONCONTINUOUS LOAD) FOR 10 MINUTE OVERLOAD RATING PLUS NOMINAL FULL LOAD CURRENT (CONTINUOUS LOAD) PER NEC 100.
4. UPS OUTPUT LOAD CABLES MUST BE RUN IN SEPARATE CONDUIT FROM INPUT CABLES.
5. POWER CABLES FROM DC LINK TO BATTERIES SHOULD BE SIZED FOR TOTAL MAXIMUM 2.0 VOLT LINE DROP AT MAXIMUM DISCHARGE CURRENT. MAXIMUM CURRENT AT END OF BATTERY DISCHARGE (300 VDC) IS DEFINED AS NONCONTINUOUS PER NEC 100.
6. GROUNDING CONDUCTORS TO BE SIZED PER NEC 250-95. NEUTRAL CONDUCTOR (IF USED) SHOULD BE SIZED FOR FULL CAPACITY.
7. ALL WIRING IS TO BE IN ACCORDANCE WITH NATIONAL AND LOCAL ELECTRICAL CODES.
8. MODULE BATTERY DISCONNECT IS PROVIDED IN A SEPARATE ENCLOSURE.
9. POWER AND CONTROL WIRING TO BE RUN IN SEPARATE CONDUITS.
10. WHEN A THREE POLE MODULE BATTERY DISCONNECT IS USED, ONE POLE MAY BE USED TO CENTER TAP THE BATTERY STRING. THIS WILL REDUCE THE MAXIMUM VOLTAGE BETWEEN ANY TWO POINTS TO ONE HALF THE STRING VOLTAGE WHEN THE MODULE BATTERY DISCONNECT IS OPEN.
11. BREAKER DESCRIPTIONS
    CB1 - SQUARE D TYPE MHL36700, 1000 AF, 700 AT, 65 KAIC.
    CB2 - SQUARE D TYPE MHL36600, 1000 AF, 600 AT, 65 KAIC.
12. NOMINAL HEAT GENERATION - 94,970 BTU/HR.

FEEDER		NOMINAL VOLTAGE	NOMINAL CURRENT	MAXIMUM CURRENT
A	AC INPUT TO UPS 3 PHASE, 3 WIRE & GROUND. A-B-C ROTATION (SEE NOTES 1,2,4,6,7)	480 VAC	504 A 455 A	630 A (W/O FILTER) 568 A (WITH FILTER)
B	AC OUTPUT TO LOAD, 3 PH., 4 WIRE & GROUND. A-B-C PHASE ROTATION (SEE NOTES 1,3,4,6,7) MAXIMUM 10 MIN. @ 125% OF NOMINAL CURRENT.	480Y/277 VAC	481 A	601 A
C	UPS DC LINK TO MODULE BATTERY DISCONNECT. (1) POSITIVE, AND (1) NEGATIVE. (SEE NOTES 5,7,8)	360 VDC	943 A	1170 A AT END OF DISCHARGE
J	MODULE BATTERY DISCONNECT TO SYSTEM BATTERY. (1) POSITIVE, AND (1) NEGATIVE AND (1) POSITIVE, AND (1) NEGATIVE FOR CENTER TAP (SEE NOTES 5,7,8,10)	360 VDC	943 A	1170 A AT END OF DISCHARGE

DRAWN BY D MCKAY	SHEET NO 1 OF 1	TITLE ONE - LINE DIAGRAM 400 KVA / 320 KW PARALLEL MODULE UPS 480 V INPUT - 480 / 277 V OUTPUT SERIES 600	DWG. NO. 97-791648-84	DATE 02/17/95
CHK BY J CAMPBELL	ECN NO		REV. NO. 1	ORDER NO.
DES APVL	REF. DWG. SL64884			Liebert 9650 JERONIMO RD. IRVINE, CALIFORNIA 92718

FILE NAME: SL648841.DWG

Figure 52 Module One-Line Diagram, 500 kVA



NOTES:

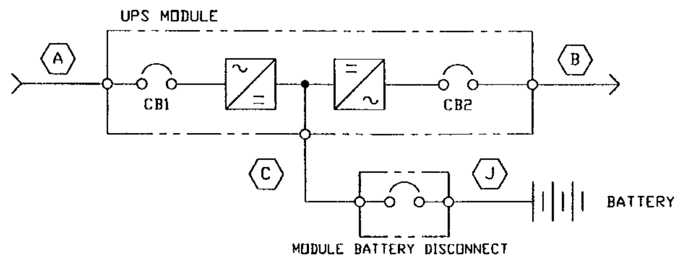
1. NOMINAL CURRENT IS BASED ON FULL RATED OUTPUT LOAD.
2. MAXIMUM CURRENT IS COMBINATION OF SHORT DURATION LOAD CURRENT (NONCONTINUOUS LOAD) FOR BATTERY RECHARGE PLUS NOMINAL FULL LOAD CURRENT (CONTINUOUS LOAD) PER NEC 100
3. MAXIMUM CURRENT IS COMBINATION OF SHORT DURATION LOAD CURRENT (NONCONTINUOUS LOAD) FOR 10 MINUTE OVERLOAD RATING PLUS NOMINAL FULL LOAD CURRENT (CONTINUOUS LOAD) PER NEC 100.
4. UPS OUTPUT LOAD CABLES MUST BE RUN IN SEPARATE CONDUIT FROM INPUT CABLES.
5. POWER CABLES FROM DC LINK TO BATTERIES SHOULD BE SIZED FOR TOTAL MAXIMUM 2.0 VOLT LINE DROP AT MAXIMUM DISCHARGE CURRENT. MAXIMUM CURRENT AT END OF BATTERY DISCHARGE (300 VDC) IS DEFINED AS NONCONTINUOUS PER NEC 100.
6. GROUNDING CONDUCTORS TO BE SIZED PER NEC 250-95. NEUTRAL CONDUCTOR (IF USED) SHOULD BE SIZED FOR FULL CAPACITY.
7. ALL WIRING IS TO BE IN ACCORDANCE WITH NATIONAL AND LOCAL ELECTRICAL CODES.
8. MODULE BATTERY DISCONNECT IS PROVIDED IN A SEPARATE ENCLOSURE.
9. POWER AND CONTROL WIRING TO BE RUN IN SEPARATE CONDUITS.
10. WHEN A THREE POLE MODULE BATTERY DISCONNECT IS USED, ONE POLE MAY BE USED TO CENTER TAP THE BATTERY STRING. THIS WILL REDUCE THE MAXIMUM VOLTAGE BETWEEN ANY TWO POINTS TO ONE HALF THE STRING VOLTAGE WHEN THE MODULE BATTERY DISCONNECT IS OPEN.
11. BREAKER DESCRIPTIONS
    CB1 - SQUARE D TYPE MHL36900, 1000 AF, 900 AT, 65 KAIC.
    CB2 - SQUARE D TYPE MHL36800, 1000 AF, 800 AT, 65 KAIC.
12. NOMINAL HEAT GENERATION - 118,713 BTU/HR.

	FEEDER	NOMINAL VOLTAGE	NOMINAL CURRENT	MAXIMUM CURRENT
A	AC INPUT TO UPS 3 PHASE, 3 WIRE & GROUND. A-B-C ROTATION (SEE NOTES 1,2,4,6,7)	480 VAC	630 A 562 A	788 A (W/O FILTER) 703 A (WITH FILTER)
B	AC OUTPUT TO LOAD, 3 PH., 4 WIRE & GROUND. A-B-C PHASE ROTATION (SEE NOTES 1,3,4,6,7) MAXIMUM 10 MIN. @ 125% OF NOMINAL CURRENT.	480Y/277 VAC	601 A	752 A
C	UPS DC LINK TO MODULE BATTERY DISCONNECT. (1) POSITIVE, AND (1) NEGATIVE. (SEE NOTES 5,7,8)	360 VDC	1178 A	1463 A AT END OF DISCHARGE
J	MODULE BATTERY DISCONNECT TO SYSTEM BATTERY. (1) POSITIVE, AND (1) NEGATIVE AND (1) POSITIVE, AND (1) NEGATIVE FOR CENTER TAP (SEE NOTES 5,7,8,10)	360 VDC	1178 A	1463 A AT END OF DISCHARGE

DRAWN BY	SHEET NO	TITLE			
D MCKAY	1 OF 1	ONE - LINE DIAGRAM 500 KVA / 400 KW PARALLEL MODULE UPS 480 V INPUT - 480 / 277 V OUTPUT SERIES 600	DWG. NO. 97-791658-84	DATE 02/21/95	Liebert 9650 JERONIMO RD. IRVINE, CALIFORNIA 92718
CHK BY J CAMPBELL	ECN NO		REV. NO. 1	ORDER NO.	
DES APVL	REF. DWG. SL65884				

FILE NAME SL658841DWG

Figure 53 Module One-Line Diagram, 500 kVA, 208 VAC



NOTES:

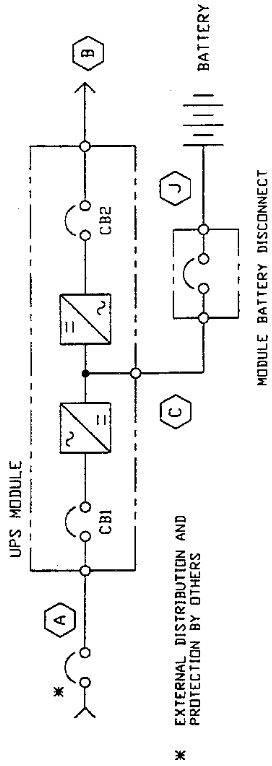
1. NOMINAL CURRENT IS BASED ON FULL RATED OUTPUT LOAD.
2. MAXIMUM CURRENT IS COMBINATION OF SHORT DURATION LOAD CURRENT (NONCONTINUOUS LOAD) FOR BATTERY RECHARGE PLUS NOMINAL FULL LOAD CURRENT (CONTINUOUS LOAD) PER NEC 100
3. MAXIMUM CURRENT IS COMBINATION OF SHORT DURATION LOAD CURRENT (NONCONTINUOUS LOAD) FOR 10 MINUTE OVERLOAD RATING PLUS NOMINAL FULL LOAD CURRENT (CONTINUOUS LOAD) PER NEC 100.
4. UPS OUTPUT LOAD CABLES MUST BE RUN IN SEPARATE CONDUIT FROM INPUT CABLES.
5. POWER CABLES FROM DC LINK TO BATTERIES SHOULD BE SIZED FOR TOTAL MAXIMUM 2.0 VOLT LINE DROP AT MAXIMUM DISCHARGE CURRENT. MAXIMUM CURRENT AT END OF BATTERY DISCHARGE (300 VDC) IS DEFINED AS NONCONTINUOUS PER NEC 100.
6. GROUNDING CONDUCTORS TO BE SIZED PER NEC 250-95. NEUTRAL CONDUCTOR (IF USED) SHOULD BE SIZED FOR FULL CAPACITY.
7. ALL WIRING IS TO BE IN ACCORDANCE WITH NATIONAL AND LOCAL ELECTRICAL CODES.
8. MODULE BATTERY DISCONNECT IS PROVIDED IN A SEPARATE ENCLOSURE.
9. POWER AND CONTROL WIRING TO BE RUN IN SEPARATE CONDUITS.
10. WHEN A THREE POLE MODULE BATTERY DISCONNECT IS USED, ONE POLE MAY BE USED TO CENTER TAP THE BATTERY STRING. THIS WILL REDUCE THE MAXIMUM VOLTAGE BETWEEN ANY TWO POINTS TO ONE HALF THE STRING VOLTAGE WHEN THE MODULE BATTERY DISCONNECT IS OPEN.
11. BREAKER DESCRIPTIONS
    CB1 - SQUARE D TYPE PHF2036, 2000 AF, 2000 AT, 125 KAIC.
    CB2 - SQUARE D TYPE PHF2036, 2000 AF, 1800 AT, 125 KAIC.
12. NOMINAL HEAT GENERATION - 126,822 BTU/HR.

	FEEDER	NOMINAL VOLTAGE	NOMINAL CURRENT	MAXIMUM CURRENT
A	AC INPUT TO UPS 3 PHASE, 3 WIRE & GROUND. A-B-C ROTATION (SEE NOTES 1,2,4,6,7)	208 VAC	1462 A 1333 A	1827 A (W/O FILTER) 1667 A (WITH FILTER)
B	AC OUTPUT TO LOAD, 3 PH., 4 WIRE & GROUND. A-B-C PHASE ROTATION (SEE NOTES 1,3,4,6,7) MAXIMUM 10 MIN. @ 125% OF NOMINAL CURRENT.	208Y/120 VAC	1388 A	1735 A
C	UPS DC LINK TO MODULE BATTERY DISCONNECT. (1) POSITIVE, AND (1) NEGATIVE. (SEE NOTES 5,7,8)	360 VDC	1185 A	1470 A AT END OF DISCHARGE
J	MODULE BATTERY DISCONNECT TO SYSTEM BATTERY. (1) POSITIVE, AND (1) NEGATIVE AND (1) POSITIVE, AND (1) NEGATIVE FOR CENTER TAP (SEE NOTES 5,7,8,10)	360 VDC	1185 A	1470 A AT END OF DISCHARGE

DRAWN BY D MCKAY	SHEET NO 1 OF 1	TITLE ONE - LINE DIAGRAM 500 KVA / 400 KW PARALLEL MODULE UPS 208 V INPUT - 208 / 120 V OUTPUT SERIES 600	DWG. NO. 97-791658-81	DATE 02/21/95	Liebert 9650 JERONIMO RD. IRVINE, CALIFORNIA 92718
CHK BY J CAMPBELL	ECN NO		REV. NO. 1	ORDER NO.	
DES APVL	REF. DWG. SL65881				

FILE NAME: SL65881I.DWG

Figure 54 Module One-Line Diagram, 625 kVA



NOTES:

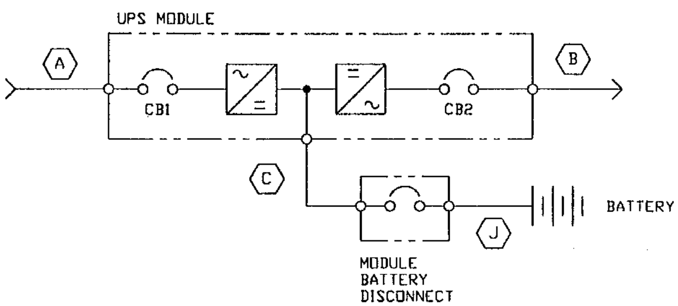
1. NOMINAL CURRENT IS BASED ON FULL RATED OUTPUT LOAD.
2. MAXIMUM CURRENT IS COMBINATION OF SHORT DURATION LOAD CURRENT (NONCONTINUOUS LOAD) FOR BATTERY RECHARGE PLUS NOMINAL FULL LOAD CURRENT (CONTINUOUS LOAD) PER NEC 100
3. MAXIMUM CURRENT IS COMBINATION OF SHORT DURATION LOAD CURRENT (NONCONTINUOUS LOAD) FOR 10 MINUTE OVERLOAD RATING PLUS NOMINAL FULL LOAD CURRENT (CONTINUOUS LOAD) PER NEC 100.
4. UPS OUTPUT LOAD CABLES MUST BE RUN IN SEPARATE CONDUIT FROM INPUT CABLES.
5. POWER CABLES FROM DC LINK TO BATTERIES SHOULD BE SIZED FOR TOTAL MAXIMUM 2.0 VOLT LINE DROP AT MAXIMUM DISCHARGE CURRENT. MAXIMUM CURRENT AT END OF BATTERY DISCHARGE (300 VDC) IS DEFINED AS NONCONTINUOUS PER NEC 100.
6. GROUNDING CONDUCTORS TO BE SIZED PER NEC 250-95. NEUTRAL CONDUCTOR (IF USED) SHOULD BE SIZED FOR FULL CAPACITY.
7. ALL WIRING IS TO BE IN ACCORDANCE WITH NATIONAL AND LOCAL ELECTRICAL CODES.
8. MODULE BATTERY DISCONNECT IS PROVIDED IN A SEPARATE ENCLOSURE.
9. POWER AND CONTROL WIRING TO BE RUN IN SEPARATE CONDUITS.
10. WHEN A THREE POLE MODULE BATTERY DISCONNECT IS USED, ONE POLE MAY BE USED TO CENTER TAP THE BATTERY STRING. THIS WILL REDUCE THE MAXIMUM VOLTAGE BETWEEN ANY TWO POINTS TO ONE HALF THE STRING VOLTAGE WHEN THE MODULE BATTERY DISCONNECT IS OPEN.
11. BREAKER DESCRIPTIONS
    CB1 - SQUARE D TYPE MHL361000, 1000 AF, 1000 AT, 65 KAIC.
    CB2 - SQUARE D TYPE MHL361000, 1000 AF, 1000 AT, 65 KAIC.
12. NOMINAL HEAT GENERATION - 148,391 BTU/HR.

FEEDER	NOMINAL VOLTAGE	NOMINAL CURRENT	MAXIMUM CURRENT
(A) AC INPUT TO UPS 3 PHASE, 3 WIRE & GROUND. A-B-C ROTATION (SEE NOTES 1,2,4,6,7)	480 VAC	778 A 711 A	973 A (W/O FILTER) 888 A (WITH FILTER)
(B) AC OUTPUT TO LOAD, 3 PH., 4 WIRE & GROUND. A-B-C PHASE ROTATION (SEE NOTES 1,3,4,6,7) MAXIMUM 10 MIN. @ 125% OF NOMINAL CURRENT.	480Y/277 VAC	752 A	940 A
(C) UPS DC LINK TO MODULE BATTERY DISCONNECT. (1) POSITIVE, AND (1) NEGATIVE. (SEE NOTES 5,7,8)	360 VDC	1473 A	1828 A AT END OF DISCHARGE
(J) MODULE BATTERY DISCONNECT TO SYSTEM BATTERY. (1) POSITIVE, AND (1) NEGATIVE AND (1) POSITIVE, AND (1) NEGATIVE FOR CENTER TAP (SEE NOTES 5,7,8,10)	360 VDC	1473 A	1828 A AT END OF DISCHARGE

DRAWN BY D MCKAY	SHEET NO 1 OF 1	TITLE ONE - LINE DIAGRAM 625 KVA / 500 KW PARALLEL MODULE UPS 480 V INPUT - 480 / 277 V OUTPUT SERIES 600	DWG. NO. 97-791670-84	DATE 02/21/95	Liebert 9650 JERONIMO RD. IRVINE, CALIFORNIA 92718
CHK BY J CAMPBELL	ECN NO		REV. NO. 1	ORDER NO.	
DES APVL	REF. DWG. SL67084				

FILE NAME SL670841.DWG

Figure 55 Module One-Line Diagram, 750 kVA (High Link - 240 Cells)



NOTES:

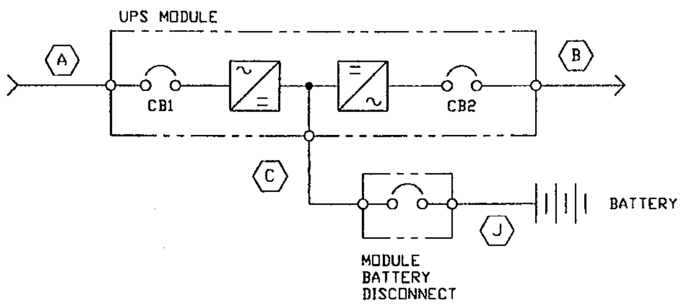
1. NOMINAL CURRENT IS BASED ON FULL RATED OUTPUT LOAD.
2. MAXIMUM CURRENT IS COMBINATION OF SHORT DURATION LOAD CURRENT (NONCONTINUOUS LOAD) FOR BATTERY RECHARGE PLUS NOMINAL FULL LOAD CURRENT (CONTINUOUS LOAD) PER NEC 100
3. MAXIMUM CURRENT IS COMBINATION OF SHORT DURATION LOAD CURRENT (NONCONTINUOUS LOAD) FOR 10 MINUTE OVERLOAD RATING PLUS NOMINAL FULL LOAD CURRENT (CONTINUOUS LOAD) PER NEC 100.
4. UPS OUTPUT LOAD CABLES MUST BE RUN IN SEPARATE CONDUIT FROM INPUT CABLES.
5. POWER CABLES FROM DC LINK TO BATTERIES SHOULD BE SIZED FOR TOTAL MAXIMUM 2.0 VOLT LINE DROP AT MAXIMUM DISCHARGE CURRENT. MAXIMUM CURRENT AT END OF BATTERY DISCHARGE (400 VDC) IS DEFINED AS NONCONTINUOUS PER NEC 100.
6. GROUNDING CONDUCTORS TO BE SIZED PER NEC 250-95. NEUTRAL CONDUCTOR MUST BE SIZED FOR FULL CAPACITY OR PER NEC 220-22.
7. ALL WIRING IS TO BE IN ACCORDANCE WITH NATIONAL AND LOCAL ELECTRICAL CODES.
8. MODULE BATTERY DISCONNECT IS PROVIDED IN A SEPARATE ENCLOSURE.
9. POWER AND CONTROL WIRING TO BE RUN IN SEPARATE CONDUITS.
10. WHEN A THREE POLE MODULE BATTERY DISCONNECT IS USED, ONE POLE MAY BE USED TO CENTER TAP THE BATTERY STRING. THIS WILL REDUCE THE MAXIMUM VOLTAGE BETWEEN ANY TWO POINTS TO ONE HALF THE STRING VOLTAGE WHEN THE MODULE BATTERY DISCONNECT IS OPEN.
11. BREAKER DESCRIPTIONS
    CB1 - SQUARE D TYPE MHL361200, 1200 AF, 1200 AT, 65 KAIC.
    CB2 - SQUARE D TYPE MHL361200, 1200 AF, 1200 AT, 65 KAIC.
12. NOMINAL HEAT GENERATION - 178,070 BTU/HR.

	FEEDER	NOMINAL VOLTAGE	NOMINAL CURRENT	MAXIMUM CURRENT
A	AC INPUT TO UPS 3 PHASE, 3 WIRE & GROUND. A-B-C ROTATION (SEE NOTES 1,2,4,6,7)	480 VAC	934 A 853 A	1167 A (W/O FILTER) 1066 A (WITH FILTER)
B	AC OUTPUT TO SYSTEM CONTROL CABINET, 3 PH. 4 WIRE & GROUND. A-B-C PHASE ROTATION (SEE NOTES 1,3,4,6,7) MAXIMUM 10 MIN. @ 125% OF NOMINAL CURRENT.	480Y/277 VAC	902 A	1128 A
C	UPS DC LINK TO MODULE BATTERY DISCONNECT. (1) POSITIVE, AND (1) NEGATIVE. (SEE NOTES 5,7,8)	480 VDC	1326 A	1644 A AT END OF DISCHARGE
J	MODULE BATTERY DISCONNECT TO SYSTEM BATTERY. (1) POSITIVE, AND (1) NEGATIVE AND (1) POSITIVE, AND (1) NEGATIVE FOR CENTER TAP (SEE NOTES 5,7,8,10)	480 VDC	1326 A	1644 A AT END OF DISCHARGE

DRAWN BY D MCKAY	SHEET NO 1 OF 1	TITLE ONE - LINE DIAGRAM 750 KVA / 600 KW 240 CELLS PARALLEL MODULE UPS 480 V INPUT - 480 / 277 V OUTPUT SERIES 600	DWG. NO. 97-791675-84	DATE 03/01/95	Liebert 9650 JERONIMO RD. IRVINE, CALIFORNIA 92718
CHK BY J CAMPBELL	ECN NO		REV. NO. 1	ORDER NO.	
DES APVL	REF. DWG. SL67584				

FILE NAME SL675841.DVG

Figure 56 Module One-Line Diagram, 750 kVA (Low Link - 180 Cells)



NOTES:

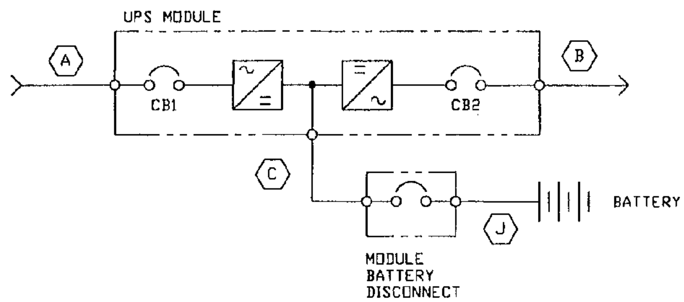
1. NOMINAL CURRENT IS BASED ON FULL RATED OUTPUT LOAD.
2. MAXIMUM CURRENT IS COMBINATION OF SHORT DURATION LOAD CURRENT (NONCONTINUOUS LOAD) FOR BATTERY RECHARGE PLUS NOMINAL FULL LOAD CURRENT (CONTINUOUS LOAD) PER NEC 100
3. MAXIMUM CURRENT IS COMBINATION OF SHORT DURATION LOAD CURRENT (NONCONTINUOUS LOAD) FOR 10 MINUTE OVERLOAD RATING PLUS NOMINAL FULL LOAD CURRENT (CONTINUOUS LOAD) PER NEC 100.
4. UPS OUTPUT LOAD CABLES MUST BE RUN IN SEPARATE CONDUIT FROM INPUT CABLES.
5. POWER CABLES FROM DC LINK TO BATTERIES SHOULD BE SIZED FOR TOTAL MAXIMUM 2.0 VOLT LINE DROP AT MAXIMUM DISCHARGE CURRENT. MAXIMUM CURRENT AT END OF BATTERY DISCHARGE (300 VDC) IS DEFINED AS NONCONTINUOUS PER NEC 100.
6. GROUNDING CONDUCTORS TO BE SIZED PER NEC 250-95. NEUTRAL CONDUCTOR MUST BE SIZED FOR FULL CAPACITY OR PER NEC 220-22.
7. ALL WIRING IS TO BE IN ACCORDANCE WITH NATIONAL AND LOCAL ELECTRICAL CODES.
8. MODULE BATTERY DISCONNECT IS PROVIDED IN A SEPARATE ENCLOSURE.
9. POWER AND CONTROL WIRING TO BE RUN IN SEPARATE CONDUITS.
10. WHEN A THREE POLE MODULE BATTERY DISCONNECT IS USED, ONE POLE MAY BE USED TO CENTER TAP THE BATTERY STRING. THIS WILL REDUCE THE MAXIMUM VOLTAGE BETWEEN ANY TWO POINTS TO ONE HALF THE STRING VOLTAGE WHEN THE MODULE BATTERY DISCONNECT IS OPEN.
11. BREAKER DESCRIPTIONS
    CB1 - SQUARE D TYPE MHL361200, 1200 AF, 1200 AT, 65 KAIC.
    CB2 - SQUARE D TYPE MHL361200, 1200 AF, 1200 AT, 65 KAIC.
12. NOMINAL HEAT GENERATION - 178,070 BTU/HR

	FEEDER	NOMINAL VOLTAGE	NOMINAL CURRENT	MAXIMUM CURRENT
A	AC INPUT TO UPS 3 PHASE, 3 WIRE & GROUND. A-B-C ROTATION (SEE NOTES 1,2,4,6,7)	480 VAC	934 A 853 A	1167 A (W/O FILTER) 1066 A (WITH FILTER)
B	AC OUTPUT TO SYSTEM CONTROL CABINET, 3 PH. 4 WIRE & GROUND. A-B-C PHASE ROTATION (SEE NOTES 1,3,4,6,7) MAXIMUM 10 MIN. @ 125% OF NOMINAL CURRENT.	480Y/277 VAC	902 A	1128 A
C	UPS DC LINK TO MODULE BATTERY DISCONNECT. (1) POSITIVE, AND (1) NEGATIVE. (SEE NOTES 5,7,8)	360 VDC	1767 A	2194 A AT END OF DISCHARGE
J	MODULE BATTERY DISCONNECT TO SYSTEM BATTERY. (1) POSITIVE, AND (1) NEGATIVE AND (1) POSITIVE, AND (1) NEGATIVE FOR CENTER TAP (SEE NOTES 5,7,8,10)	360 VDC	1767 A	2194 A AT END OF DISCHARGE

DRAWN BY B FISH	SHEET NO 1 OF 1	TITLE ONE - LINE DIAGRAM 750 KVA / 600 KW 180 CELLS PARALLEL MODULE UPS 480 V INPUT - 480 / 277 V OUTPUT SERIES 600	DWG. NO. 97-791676-24	DATE 06/06/95
CHK BY J CAMPBELL	ECN NO		REV. NO. 1	ORDER NO.
DES APVL	REF. DWG. SL67624		Liebert 9650 JERONIMO RD. IRVINE, CALIFORNIA 92718	

FILE NAME: SL676241.DWG

Figure 57 Module One-Line Diagram, 1000 kVA



NOTES:

1. NOMINAL CURRENT IS BASED ON FULL RATED OUTPUT LOAD.
2. MAXIMUM CURRENT IS COMBINATION OF SHORT DURATION LOAD CURRENT (NONCONTINUOUS LOAD) FOR BATTERY RECHARGE PLUS NOMINAL FULL LOAD CURRENT (CONTINUOUS LOAD) PER NEC 100
3. MAXIMUM CURRENT IS COMBINATION OF SHORT DURATION LOAD CURRENT (NONCONTINUOUS LOAD) FOR 10 MINUTE OVERLOAD RATING PLUS NOMINAL FULL LOAD CURRENT (CONTINUOUS LOAD) PER NEC 100.
4. UPS OUTPUT LOAD CABLES MUST BE RUN IN SEPARATE CONDUIT FROM INPUT CABLES.
5. POWER CABLES FROM DC LINK TO BATTERIES SHOULD BE SIZED FOR TOTAL MAXIMUM 2.0 VOLT LINE DROP AT MAXIMUM DISCHARGE CURRENT. MAXIMUM CURRENT AT END OF BATTERY DISCHARGE (400 VDC) IS DEFINED AS NONCONTINUOUS PER NEC 100.
6. GROUNDING CONDUCTORS TO BE SIZED PER NEC 250-95. NEUTRAL CONDUCTOR MUST BE SIZED FOR FULL CAPACITY OR PER NEC 220-22.
7. ALL WIRING IS TO BE IN ACCORDANCE WITH NATIONAL AND LOCAL ELECTRICAL CODES.
8. MODULE BATTERY DISCONNECT IS PROVIDED IN A SEPARATE ENCLOSURE.
9. POWER AND CONTROL WIRING TO BE RUN IN SEPARATE CONDUITS.
10. WHEN A THREE POLE MODULE BATTERY DISCONNECT IS USED, ONE POLE MAY BE USED TO CENTER TAP THE BATTERY STRING. THIS WILL REDUCE THE MAXIMUM VOLTAGE BETWEEN ANY TWO POINTS TO ONE HALF THE STRING VOLTAGE WHEN THE MODULE BATTERY DISCONNECT IS OPEN.
11. BREAKER DESCRIPTIONS
    CB1 - SQUARE D TYPE PHF2036, 2000 AF, 1600 AT, 100 KAIC.
    CB2 - SQUARE D TYPE PHF2036, 2000 AF, 1600 AT, 100 KAIC.
12. NOMINAL HEAT GENERATION - 205,514 BTU/HR

	FEEDER	NOMINAL VOLTAGE	NOMINAL CURRENT	MAXIMUM CURRENT
A	AC INPUT TO UPS 3 PHASE, 3 WIRE & GROUND. A-B-C ROTATION (SEE NOTES 1,2,4,6,7)	480 VAC	1217 A 1113 A	1522 A (W/O FILTER) 1391 A (WITH FILTER)
B	AC OUTPUT TO SYSTEM CONTROL CABINET, 3 PH. 4 WIRE & GROUND. A-B-C PHASE ROTATION (SEE NOTES 1,3,4,6,7) MAXIMUM 10 MIN. @ 125% OF NOMINAL CURRENT.	480Y/277 VAC	1203 A	1503 A
C	UPS DC LINK TO MODULE BATTERY DISCONNECT. (1) POSITIVE, AND (1) NEGATIVE. (SEE NOTES 5,7,8)	480 VDC	1749 A	2169 A AT END OF DISCHARGE
J	MODULE BATTERY DISCONNECT TO SYSTEM BATTERY. (1) POSITIVE, AND (1) NEGATIVE AND (1) POSITIVE, AND (1) NEGATIVE FOR CENTER TAP (SEE NOTES 5,7,8,10)	480 VDC	1749 A	2169 A AT END OF DISCHARGE

DRAWN BY B FISH	SHEET NO 1 OF 1	TITLE ONE - LINE DIAGRAM 1000 KVA / 800 KW PARALLEL MODULE UPS 480 V INPUT - 480 / 277 V OUTPUT SERIES 600			
CHK BY J CAMPBELL	ECN NO		DWG. NO. 97-791686-24	DATE 06/08/95	Liebert 9650 JERONIMO RD. IRVINE, CALIFORNIA 92718
DES APVL	REF. DWG. SL68624		REV. NO. 1	ORDER NO.	

FILE NAME: SL68624I.DWG

Figure 58 One-Line Diagram, System Control Cabinet (SCCA)

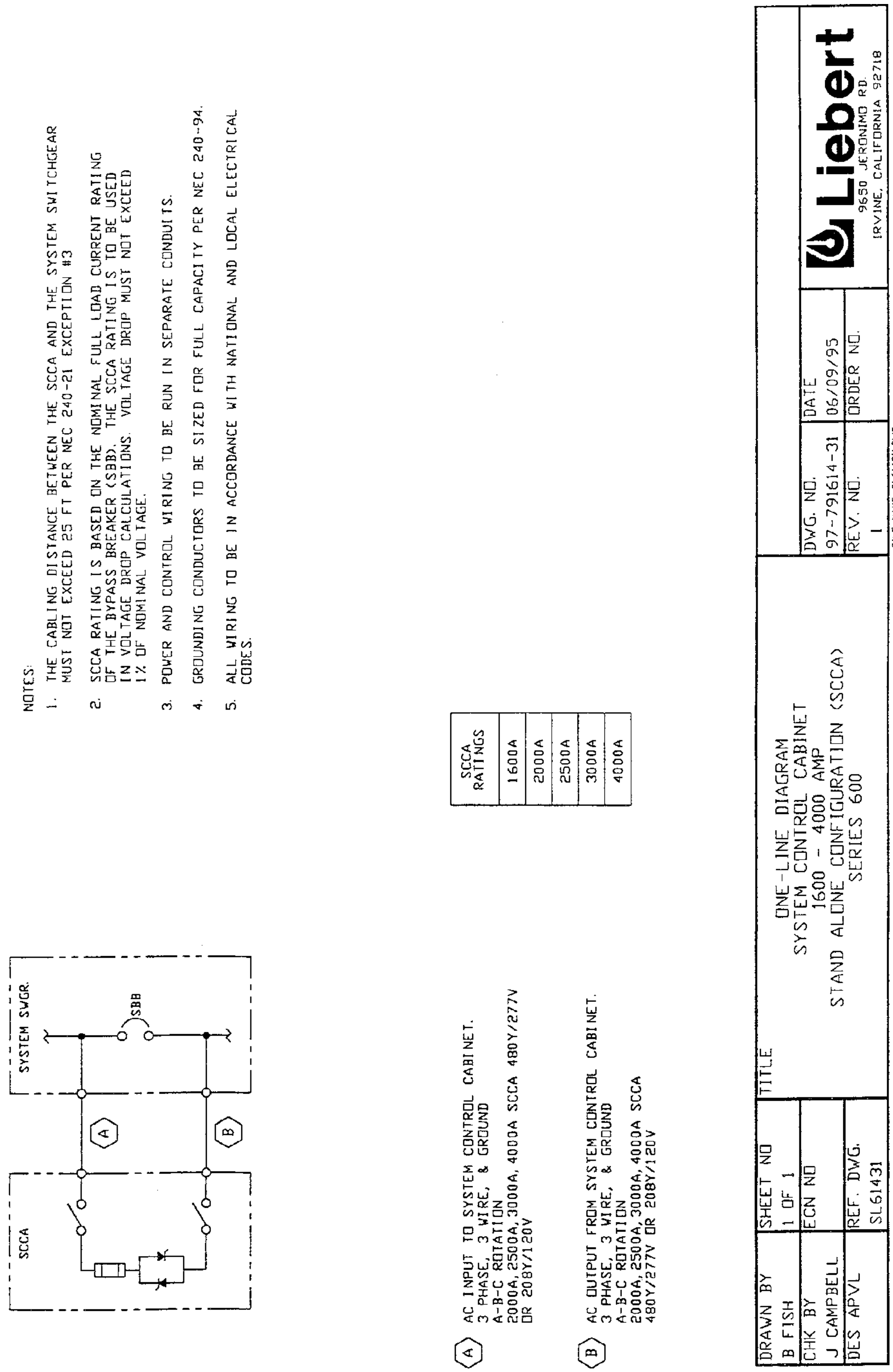


Figure 59 System One-Line Diagram, Three Modules with Two Breaker Maintenance Bypass

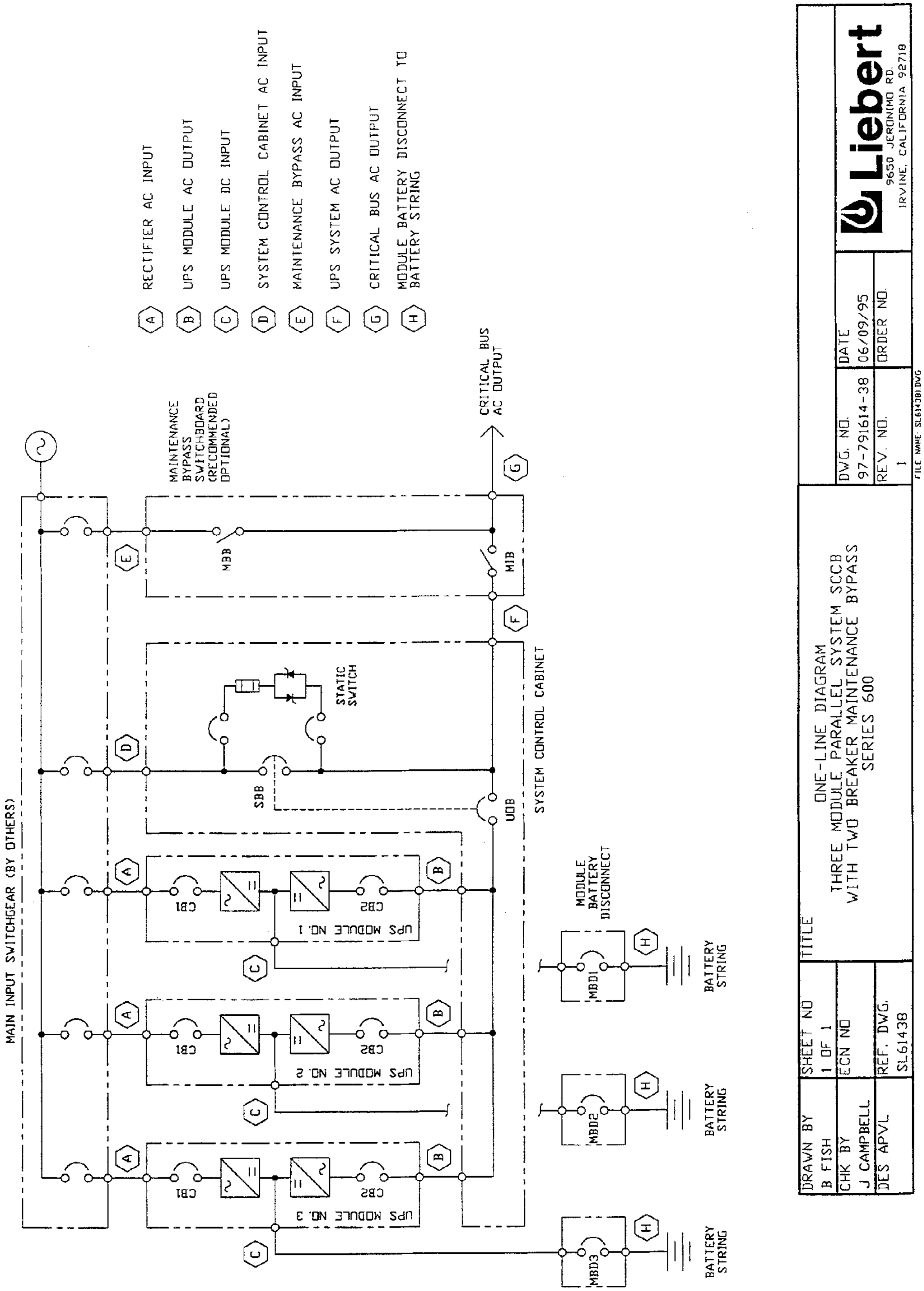


Figure 60 System One-Line Diagram, Three Modules with Three Breaker Maintenance Bypass

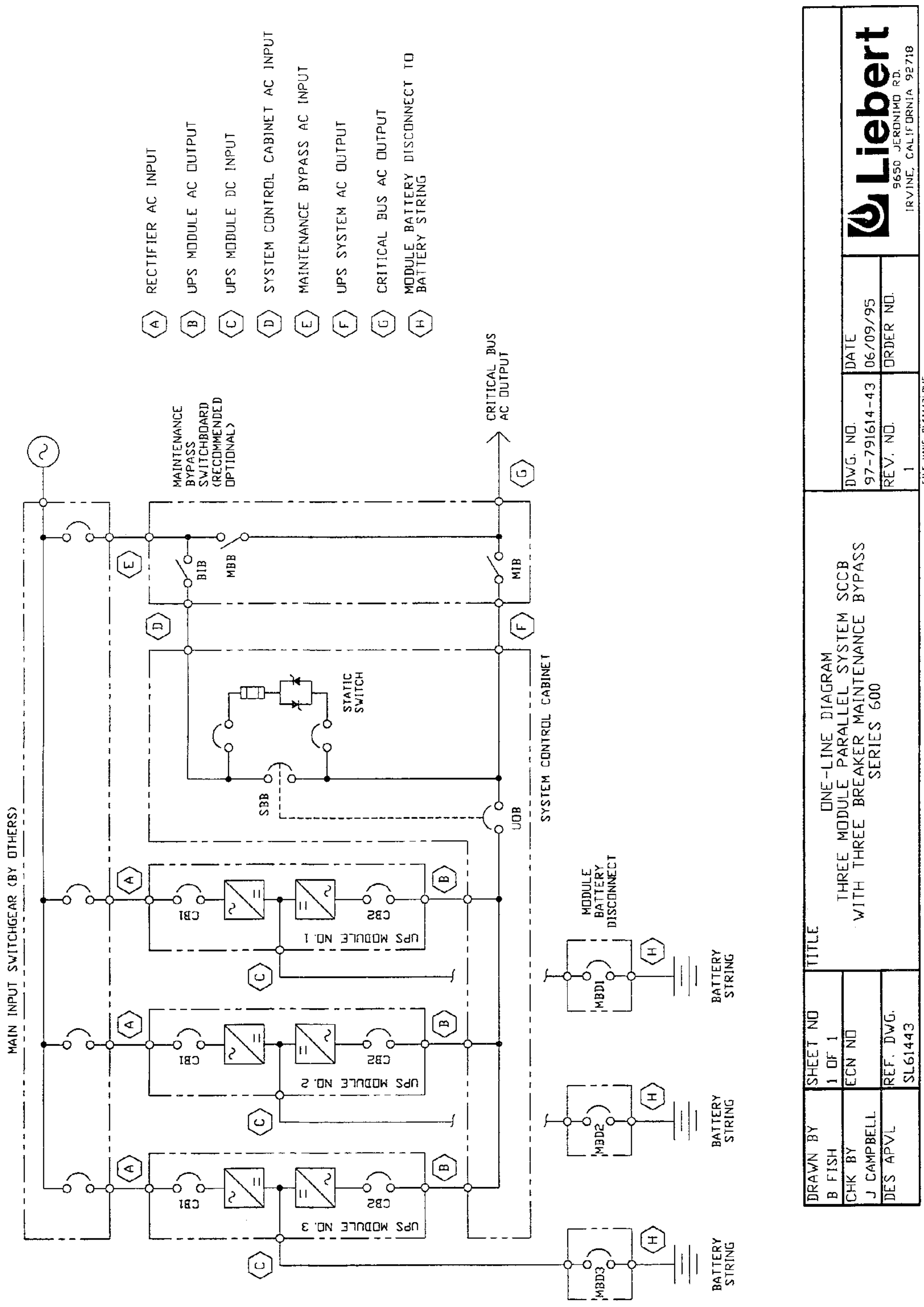


Figure 61 Control Wiring Interconnect Diagram

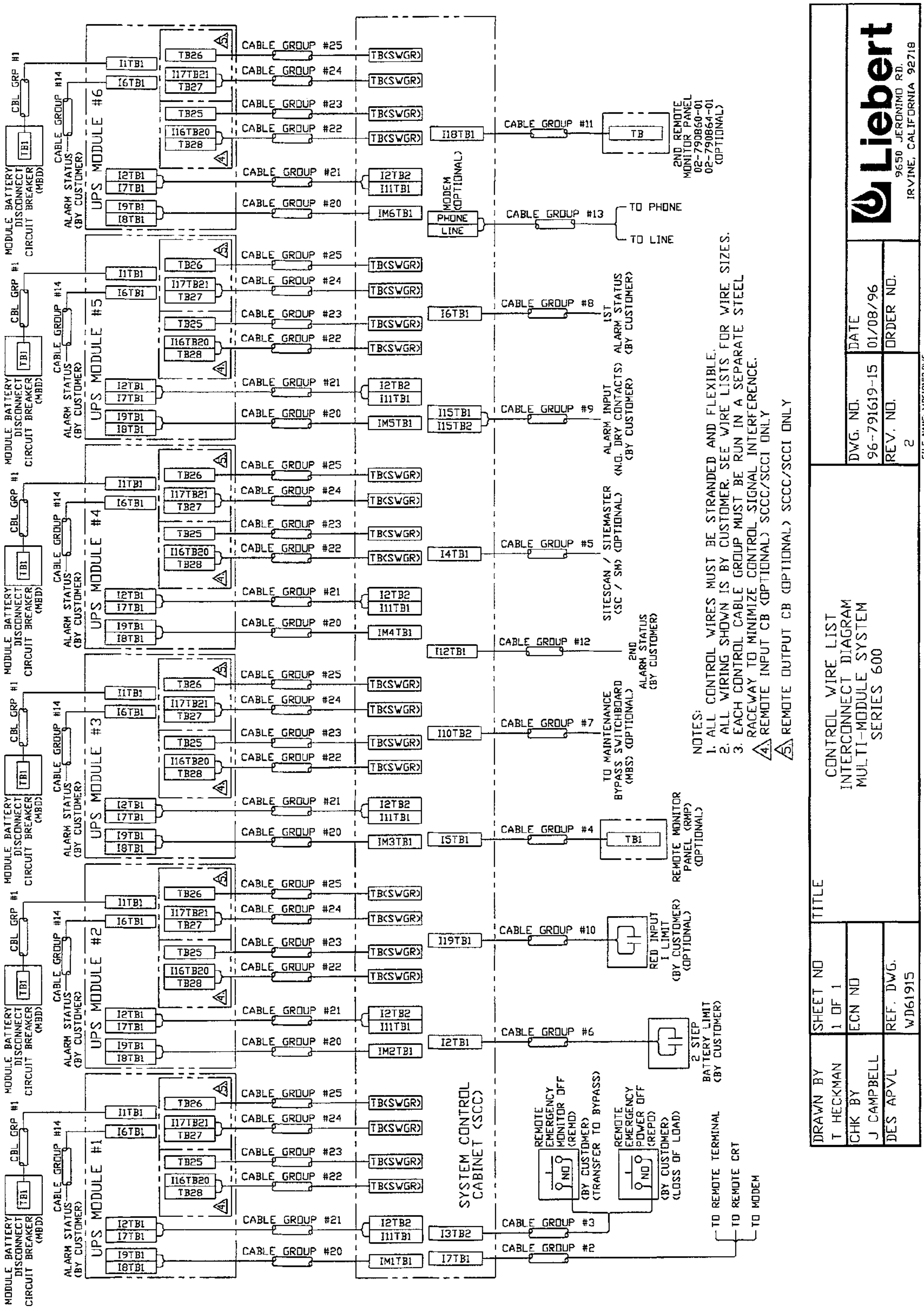


Figure 62 Control Wiring Interconnect Diagram, SCCA and Switchgear

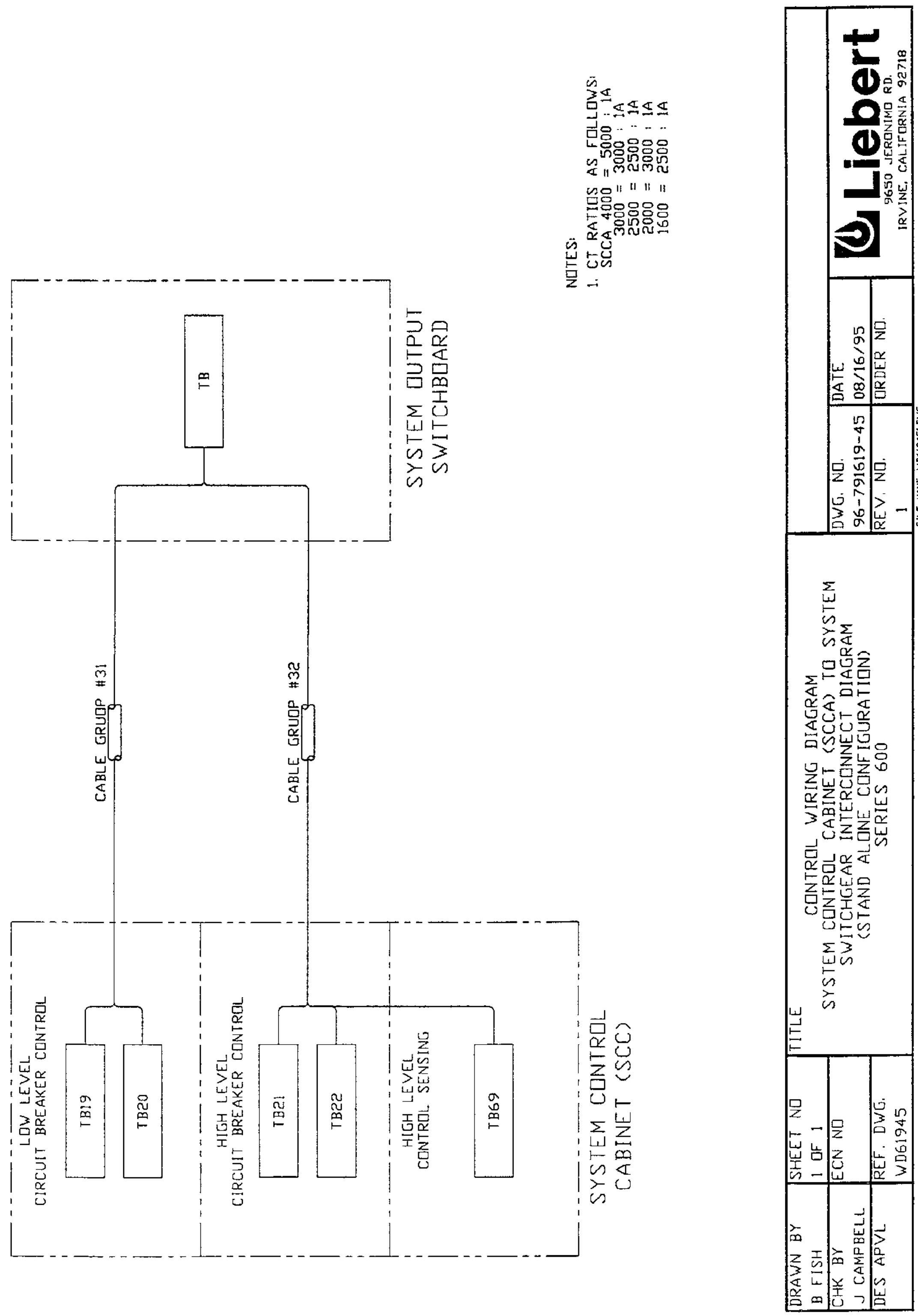


Figure 63 Control Connection Location Diagram, Module

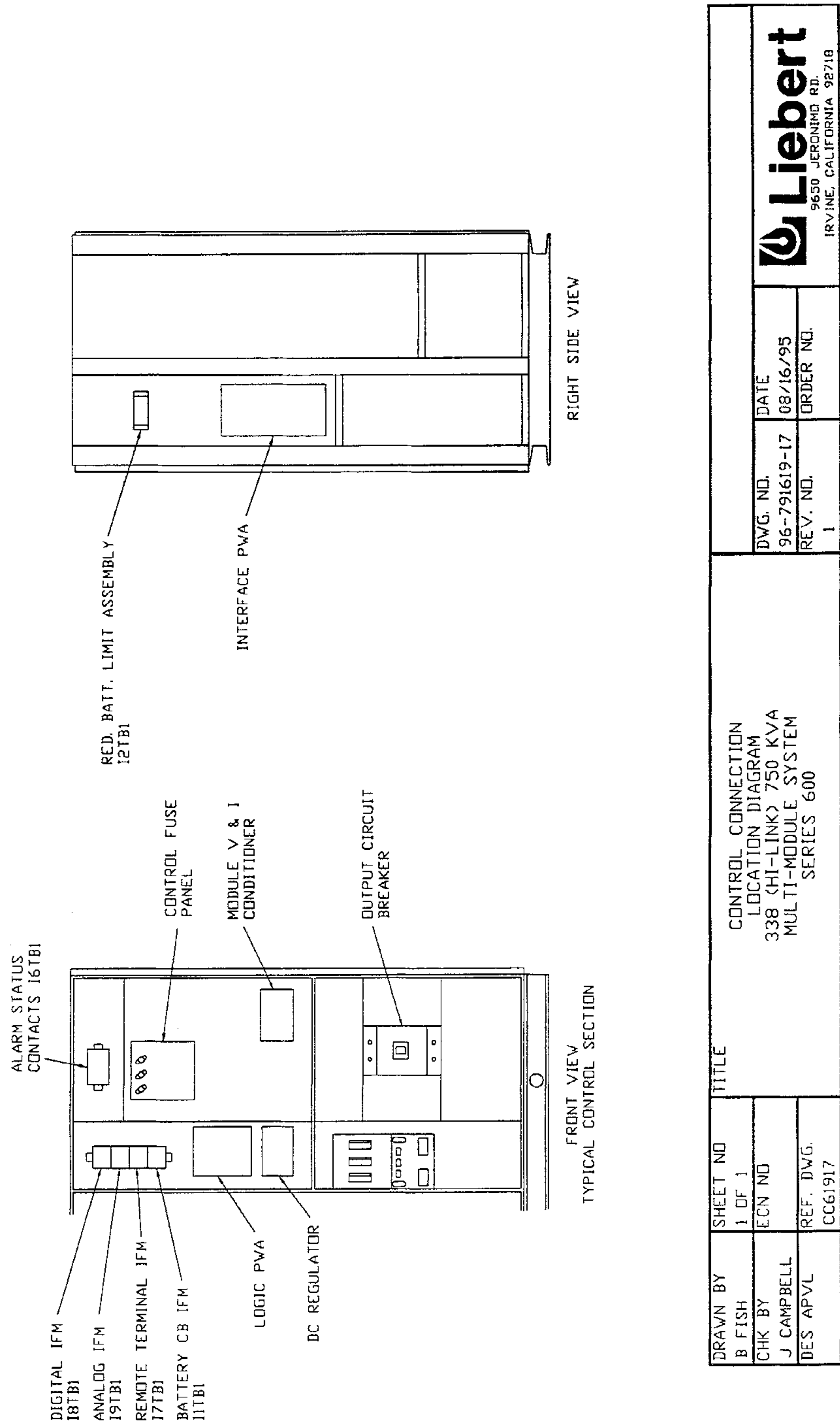


Figure 64 Control Connection Location Diagram, System Control Cabinet

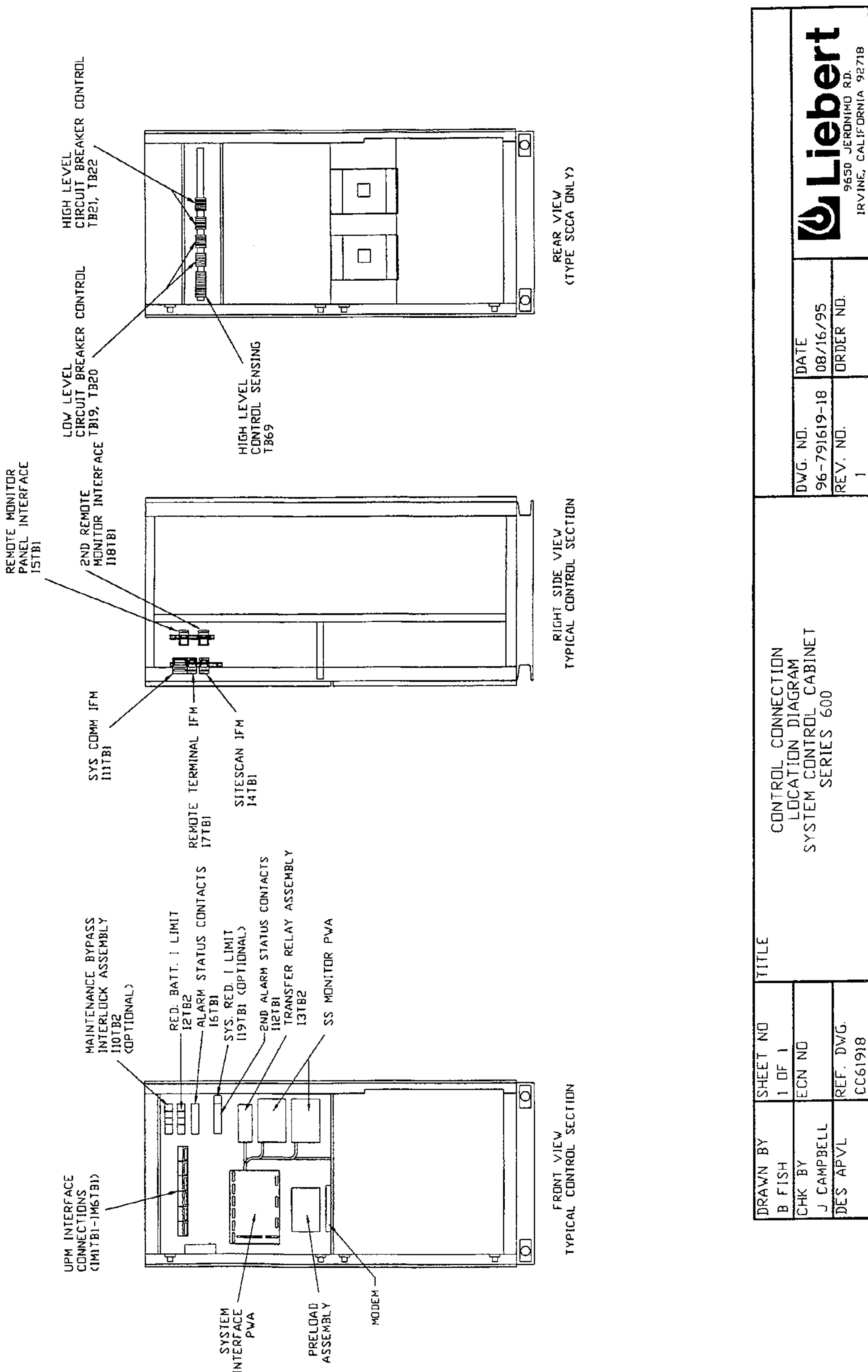


Figure 65 Video Display Terminal Wiring

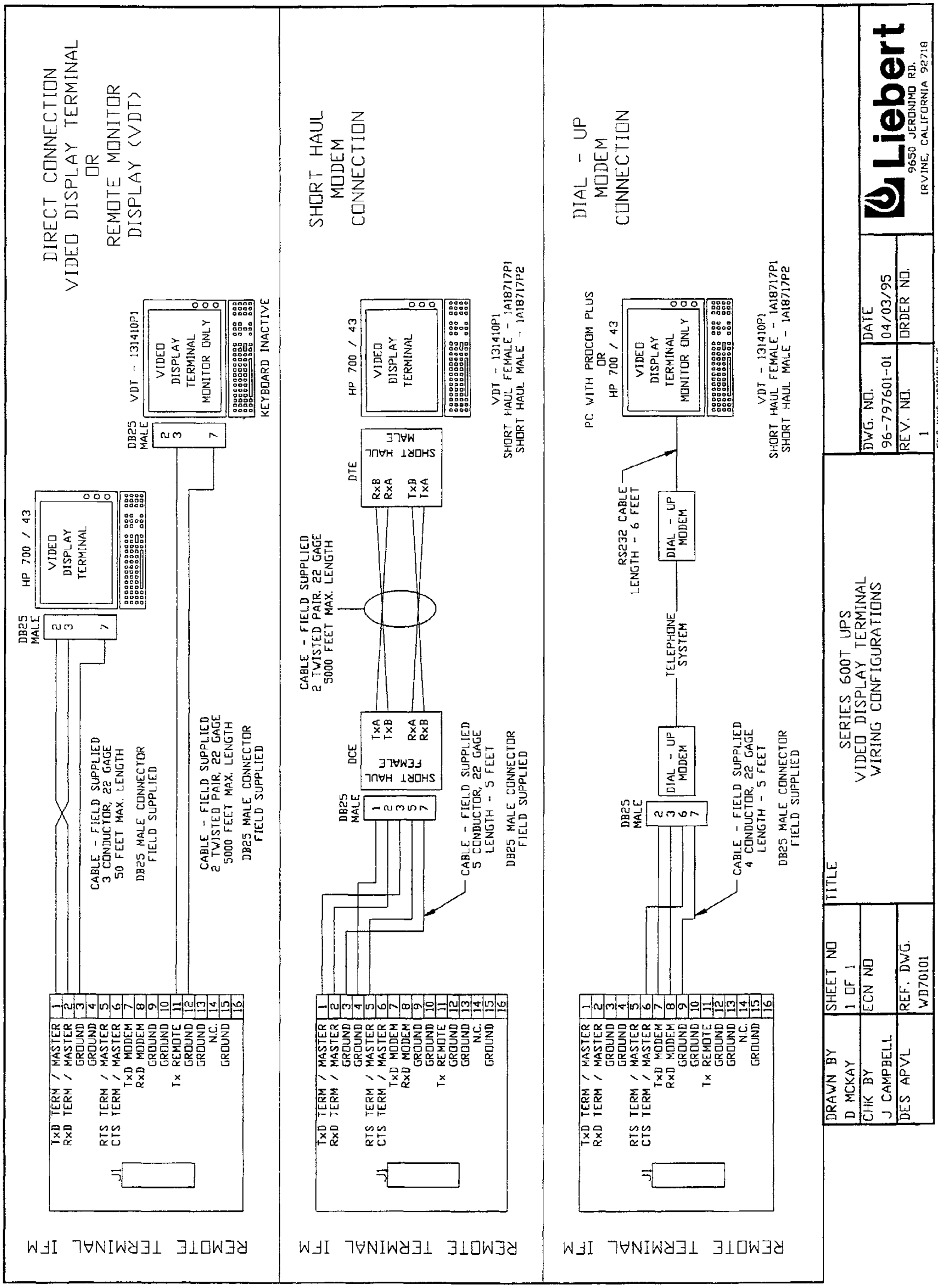


Figure 66 Battery Circuit Breaker

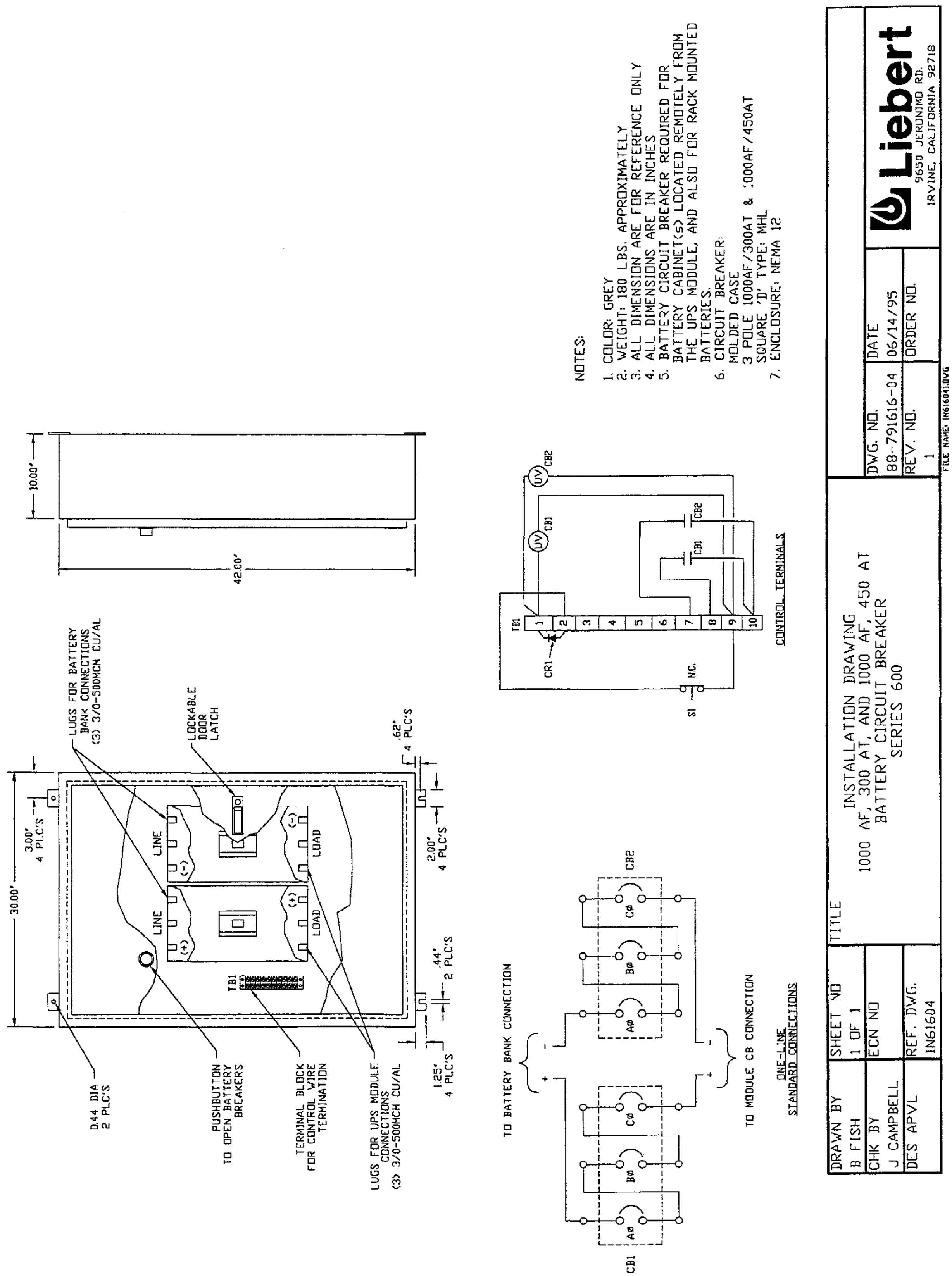


Figure 67 Parallel Battery Configurations

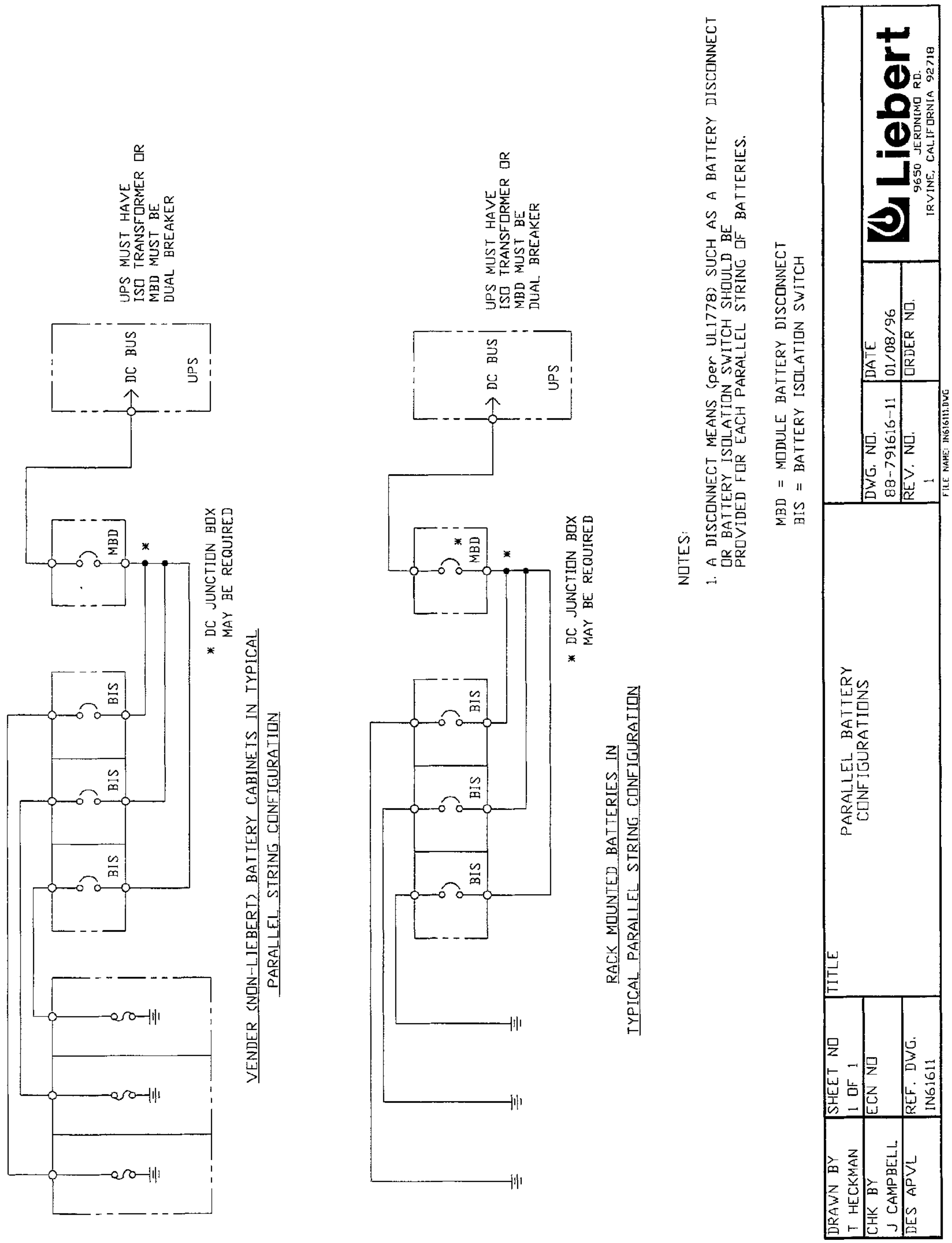
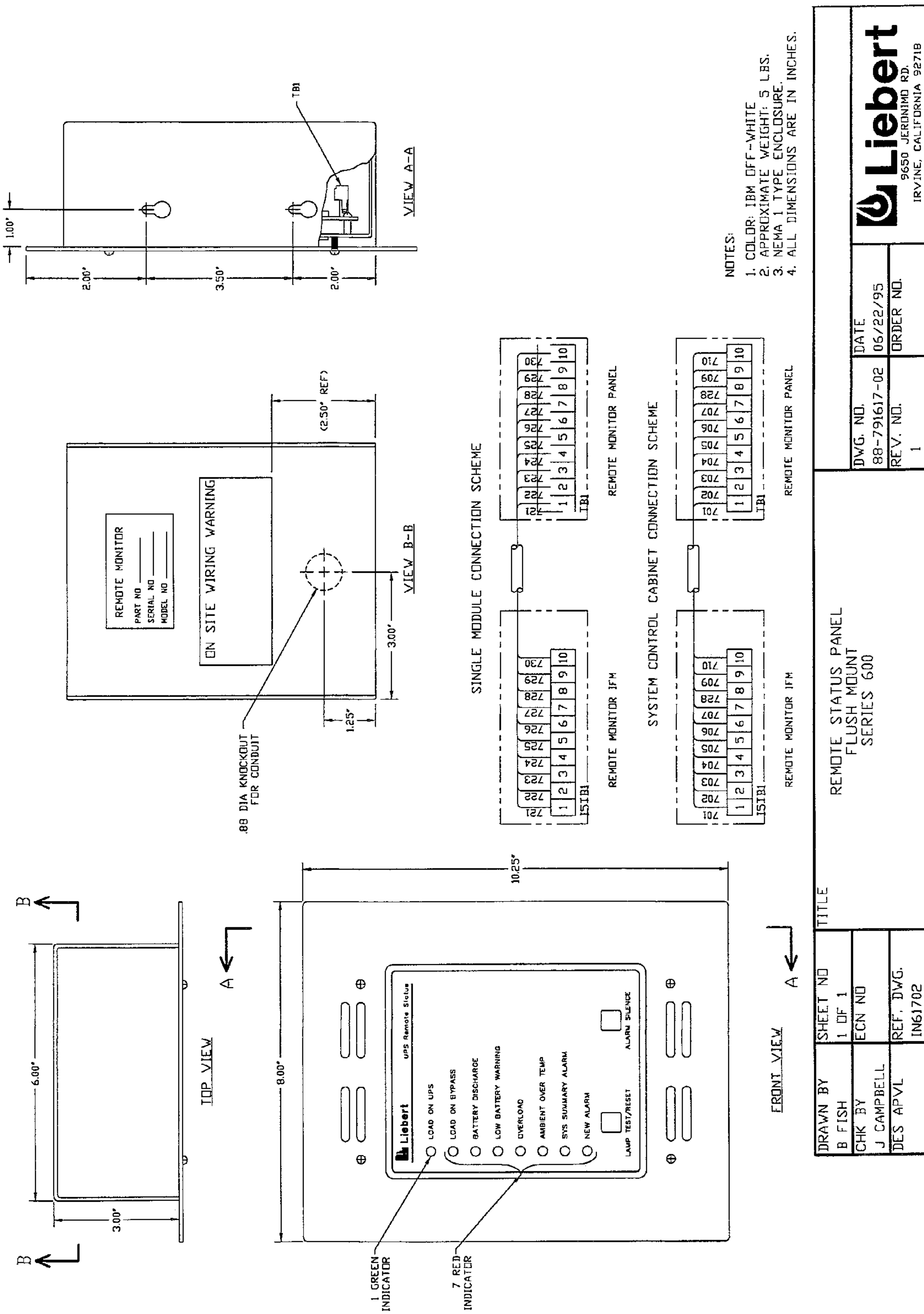
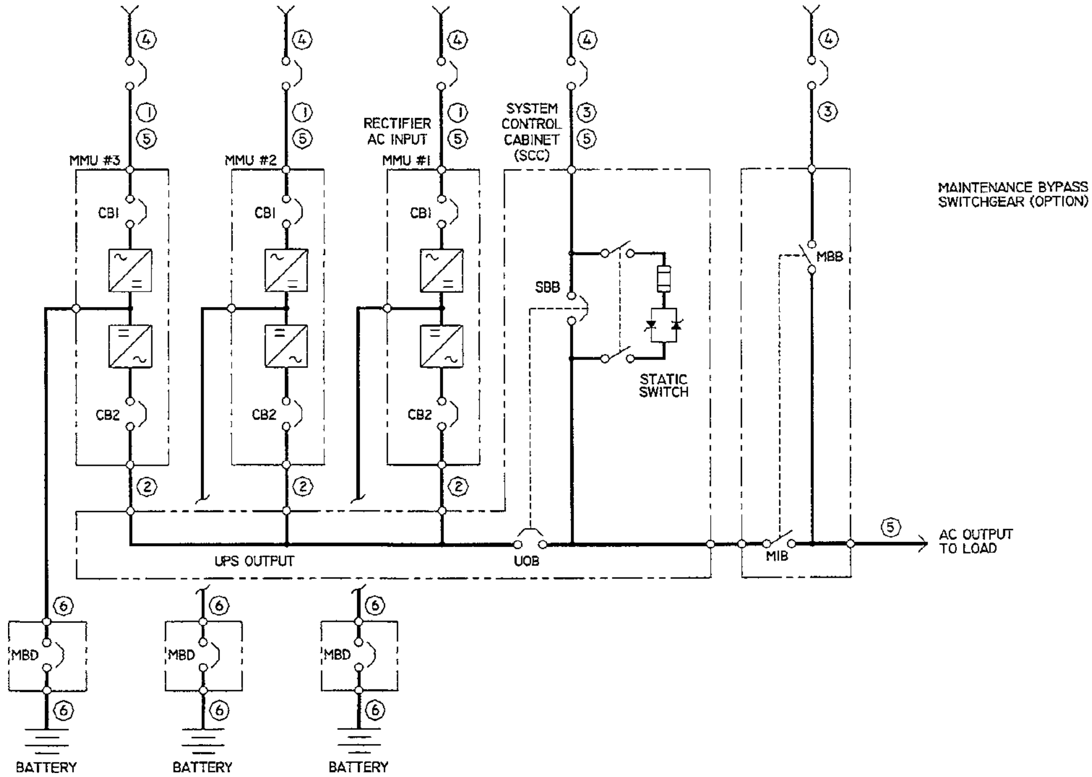


Figure 68 Remote Status Panel



10.0 APPENDIX A - SERIES 600 UPS SITE PLANNING DATA

338-1000 kVA Multi-Module Units



10.1 Notes

1. Nominal rectifier AC input current (considered continuous) is based on full rated output load. Maximum current includes nominal input current and maximum battery recharge current (considered noncontinuous). Continuous and noncontinuous current limit are defined in NEC 100. Maximum input current is controlled by current limit setting which is adjustable. Values shown are for maximum setting of 125%. Standard factory setting is 115%.
2. Nominal AC output current (considered continuous) is based on full rated output load. Maximum current includes nominal output current and overload for 10 minutes.
3. Bypass AC input current (considered continuous) is based on full rated output load.
4. Feeder protection (by others in external equipment) for rectifier AC input and bypass AC input is recommended to be provided by separate overcurrent protection devices.
5. UPS output load cables must be run in separate conduit from input cables.
6. Power cable from module DC bus to battery should be sized for a total maximum 2.0 volt line drop (measured at the module) at maximum discharge current.
7. Grounding conductors to be sized per NEC 250-95. A neutral conductor is required from each MMU output to the SCC. Neutral conductors to be sized for full capacity per NEC 310-16, Note 10 for systems with 4-wire loads and half capacity for systems with 3-wire loads.
8. Rectifier AC Input: 3-phase, 3-wire, plus ground.
   MMU Output to System Control Cabinet: 3-phase, 4-wire, plus ground.
   Bypass AC Input and AC Output to Load: 3-phase, 3 or 4-wire, plus ground.
   Module DC Input from Battery: 2-wire, (positive and negative).
9. All wiring is to be in accordance with National and Local Electrical Codes.
10. Minimum clearance is 2 feet above UPS.
11. Top or bottom cable entry through removable access plates. Cut plate to suit conduit size.
12. Control wiring and power cables must be run in separate conduits. Control wiring must be stranded conductors.
13. UPS module will be shipped in sections. Reconnect shipping splits according to drawings supplied with the equipment.

Table 4 338-1000 kVA Multi-Module Unit, 480 Volt - Standard Module

UPS Rating		* Rectifier AC Input Current		Inverter AC Output Current		Required Battery Discon-nect Rating	Maximum Battery Current at End of Discharge	% Efficiency at Full Load	Maximum Heat Dis-sipation BTU/hr.	Dimen-sions Inches	Approx. Weight Lb.	Floor Loading Lbs./ Sq.Ft.
kVA	kW	Nom	Max	Nom	Max	Amperes	Amperes		Full Load	(WxDxH)	(Un-packed)	(Distribu-ted Loading)
338	270	420	525	406	507	1000	993	92	80131	128x38x78	8300	246
400	320	504	630	481	601	1200	1170	92	94970	164x38x78	9900	229
400	360	560	700	481	601	1200	1316	92	106842	164x38x78	9900	229
500	400	630	788	601	752	1600	1463	92	118713	164x38x78	10600	245
500	450	700	875	601	752	1600	1646	92	133552	164x38x78	10600	245
625	500	778	973	752	940	2000	1828	92	148391	164x41x78	12300	263
750^{HL}	600	934	1167	902	1128	1600	1644	92	178070	164x41x78	13925	298
750^{LL}	600	934	1167	902	1128	2000	2194	92	178070	177x44x82	14600	270
1000	800	1217	1522	1203	1504	2500	2169	93	205514	177x44x82	16555	306
1000	900	1369	1712	1203	1504	2500	2440	93	231203	177x44x82	16555	306
Applicable Notes:		1,4,5,7,8, 9,11,12		2,5,7,8, 9,11,12		6	6,8,9, 11,12	—	—	13	13	—

For explanation of notes, see referenced numbers in **10.1 - Notes**

* Nominal Input Power Factor 0.85 lagging at full load; 9% Maximum Total Input Harmonic Current Distortion (THD) at full load.

HL - 750 kVA module with 240 battery cells

LL - 750 kVA module with 180 battery cells

Table 5 338-1000 kVA Multi-Module Unit, 480 Volt - Standard Module With Optional Low Distortion Input Filter

UPS Rating		* Rectifier AC Input Current		Inverter AC Output Current		Required Battery Discon-nect Rating	Maximum Battery Current at End of Discharge	% Efficiency at Full Load	Maximum Heat Dis-sipation BTU/hr.	Dimen-sions Inches	Approx. Weight Lb.	Floor Loading Lb./ Sq.Ft.
kVA	kW	Nom	Max	Nom	Max	Amperes	Amperes		Full Load	(WxDxH)	(Un-packed)	(Distribu-ted Loading)
338	270	380	474	406	507	1000	993	92	80131	128x38x78	8700	258
400	320	455	568	481	601	1200	1170	92	94970	164x38x78	10300	238
400	360	512	639	481	601	1200	1316	92	106842	164x38x78	10300	238
500	400	562	703	601	752	1600	1463	92	118713	164x38x78	11150	258
500	450	633	791	601	752	1600	1646	92	133552	164x38x78	11150	258
625	500	711	888	752	940	2000	1828	92	148391	164x41x78	12950	277
750^{HL}	600	853	1066	902	1128	1600	1644	92	178070	164x41x78	14200	304
750^{LL}	600	853	1066	902	1128	2000	2194	92	178070	177x44x82	15450	286
1000	800	1125	1406	1203	1504	2500	2169	93	205514	177x44x82	17400	322
1000	900	1265	1582	1203	1504	2500	2440	93	231203	177x44x82	17400	322
Applicable Notes:		1,4,5,7,8, 9,11,12		2,5,7,8, 9,11,12		6	6,8,9, 11,12	—	—	13	13	—

For explanation of notes, see referenced numbers in **10.1 - Notes**

* Nominal Input Power Factor 0.92 lagging at full load; 4% Maximum Total Input Harmonic Current Distortion (THD) at full load.

HL - 750 kVA module with 240 battery cells

LL - 750 kVA module with 180 battery cells

Table 6 338-500 kVA Multi-Module Unit, 208 Volt - Standard Module

UPS Rating		* Rectifier AC Input Current		Inverter AC Output Current		Required Battery Discon-nect Rating	Maximum Battery Current at End of Discharge	% Efficiency at Full Load	Maximum Heat Dis-sipation BTU/hr.	Dimen-sions Inches	Approx. Weight Lb.	Floor Loading Lb./ Sq.Ft.
kVA	kW	Nom	Max	Nom	Max	Amperes	Amperes		Full Load	(WxDxH)	(Un-packed)	(Distribu-ted Loading)
338	270	980	1226	937	1171	1000	998	92	91138	128x38x78	8600	255
400	320	1170	1462	1110	1388	1200	1176	92	101457	218x38x78	10250	214
400	360	1300	1625	1110	1388	1200	1323	92	114140	218x38x78	10250	214
500	400	1462	1827	1388	1735	1600	1470	92	126822	218x38x78	10950	228
500	450	1625	2031	1388	1735	1600	1654	92	142675	218x38x78	10950	228
Applicable Notes:		1,4,5,7,8, 9,11,12		2,5,7,8, 9,11,12		6	6,8,9, 11,12	—	—	13	13	—

For explanation of notes, see referenced numbers in **10.1 - Notes**

* Nominal Input Power Factor 0.85 lagging at full load; 9% Maximum Total Input Harmonic Current Distortion (THD) at full load.

Table 7 338-500 kVA Multi-Module Unit, 208 Volt - Standard Module With Optional Low Distortion Input Filter

UPS Rating		* Rectifier AC Input Current		Inverter AC Output Current		Required Battery Discon-nect Rating	Maximum Battery Current at End of Discharge	% Efficiency at Full Load	Maximum Heat Dis-sipation BTU/hr.	Dimen-sions Inches	Approx. Weight Lb.	Floor Loading Lb./ Sq.Ft.
kVA	kW	Nom	Max	Nom	Max	Amperes	Amperes		Full Load	(WxDxH)	(Un-packed)	(Distribu-ted Loading)
338	270	895	1119	937	1171	1000	998	92	91138	128x38x78	9100	270
400	320	1055	1319	1110	1388	1200	1176	92	101457	218x38x78	10750	224
400	360	1187	1484	1110	1388	1200	1323	92	114140	218x38x78	10750	224
500	400	1333	1667	1388	1735	1600	1470	92	126822	218x38x78	11650	243
500	450	1500	1875	1388	1735	1600	1654	92	142675	218x38x78	11650	243
Applicable Notes:		1,4,5,7,8, 9,11,12		2,5,7,8, 9,11,12		6	6,8,9, 11,12	—	—	13	13	—

For explanation of notes, see referenced numbers in **10.1 - Notes**

* Nominal Input Power Factor 0.92 lagging at full load; 4% Maximum Total Input Harmonic Current Distortion (THD) at full load.

Table 8 338-1000 kVA Multi-Module Unit, 600 Volt - Standard Module

UPS Rating		* Rectifier AC Input Current		Inverter AC Output Current		Required Battery Discon-nect Rating	Maximum Battery Current at End of Discharge	% Efficiency at Full Load	Maximum Heat Dis-sipation BTU/hr.	Dimen-sions Inches	Approx. Weight Lb.	Floor Loading Lb./ Sq.Ft.
kVA	kW	Nom	Max	Nom	Max	Amperes	Amperes		Full Load	(WxDxH)	(Un-packed)	(Distribu-ted Loading)
338	270	336	420	325	406	1000	993	92	80131	128x38x78	8300	246
400	320	403	504	385	481	1200	1170	92	94970	164x38x78	9900	229
400	360	448	560	385	481	1200	1316	92	106842	164x38x78	9900	229
500	400	504	630	481	601	1600	1463	92	118713	164x38x78	10600	245
500	450	567	709	481	601	1600	1646	92	133552	164x38x78	10600	245
625	500	630	788	601	752	2000	1828	92	148391	164x41x78	12300	263
750^HL	600	747	934	722	902	1600	1644	92	178070	164x41x78	13925	298
750^LL	600	747	934	722	902	2000	2194	92	178070	177x44x82	14600	270
1000	800	974	1217	962	1203	2500	2169	93	205514	177x44x82	16555	306
1000	900	1096	1369	962	1203	2500	2440	93	231203	177x44x82	16555	306
Applicable Notes:		1,4,5,7,8, 9,11,12		2,5,7,8, 9,11,12		6	6,8,9, 11,12	—	—	13	13	—

For explanation of notes, see referenced numbers in **10.1 - Notes**

* Nominal Input Power Factor 0.85 lagging at full load; 9% Maximum Total Input Harmonic Current Distortion (THD) at full load.

HL - 750 kVA module with 240 battery cells

LL - 750 kVA module with 180 battery cells

Table 9 338-1000 kVA Multi-Module Unit, 600 Volt - Standard Module With Optional Low Distortion Input Filter

UPS Rating		* Rectifier AC Input Current		Inverter AC Output Current		Required Battery Discon-nect Rating	Maximum Battery Current at End of Discharge	% Efficiency at Full Load	Maximum Heat Dis-sipation BTU/hr.	Dimen-sions Inches	Approx. Weight Lb.	Floor Loading Lb./ Sq.Ft.
kVA	kW	Nom	Max	Nom	Max	Amperes	Amperes		Full Load	(WxDxH)	(Un-packed)	(Distribu-ted Loading)
338	270	307	384	325	406	1000	993	92	80131	128x38x78	8700	258
400	320	360	450	385	481	1200	1170	92	94970	164x38x78	10300	238
400	360	405	506	385	481	1200	1316	92	106842	164x38x78	10300	238
500	400	460	575	481	601	1600	1463	92	118713	164x38x78	11150	258
500	450	517	647	481	601	1600	1646	92	133552	164x38x78	11150	258
625	500	575	718	601	752	2000	1828	92	148391	164x41x78	12950	277
750^HL	600	682	853	722	902	1600	1644	92	178070	164x41x78	14200	304
750^LL	600	682	853	722	902	2000	2194	92	178070	177x44x82	15450	286
1000	800	890	1113	962	1203	2500	2169	93	205514	177x44x82	17400	322
1000	900	1012	1265	962	1203	2500	2440	93	231203	177x44x82	17400	322
Applicable Notes:		1,4,5,7,8, 9,11,12		2,5,7,8, 9,11,12		6	6,8,9, 11,12	—	—	13	13	—

For explanation of notes, see referenced numbers in **10.1 - Notes**

* Nominal Input Power Factor 0.92 lagging at full load; 4% Maximum Total Input Harmonic Current Distortion (THD) at full load.

HL - 750 kVA module with 240 battery cells

LL - 750 kVA module with 180 battery cells

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Multi-Module Three Phase

338 kVA to 1000 kVA; 60 Hz

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